Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 1

Exercise 1

Consider the vectorial field $F(x,y,z) = \left(-6xy^2 + \frac{(-2y-1)yz}{xyz+1} - 2xy\right.$
$, -6x^2y - x^2 + \frac{x(-2y-1)z}{xyz+1} - 2\log(xyz+1), \frac{x(-2y-1)y}{xyz+1}$
$\left.\right)$. Compute the potential function for this field whose potential at the origin is 1 .
. Calculate the value of the potential at the point $p = (0,4,9)$.

1) $-\frac{6}{5}$ 2) $-\frac{5}{2}$ 3) 1 4) $\frac{49}{10}$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] \dashrightarrow R^2$
$r(t) = \{(3t+5)\sin(2t)(4\cos(7t)+8), (6t+8)\sin(t)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 384.426 2) 1151.63 3) 2877.83 4) 1918.83

Exercise 3

Consider the vector field $F(x,y,z) = \{-6z^2, -xz - 5x^2y^2z, 3x\}$ and the surface

$S \equiv \left(\frac{7+x}{6}\right)^2 + \left(\frac{1+y}{7}\right)^2 + \left(\frac{1+z}{4}\right)^2 = 1$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) $-395\,489.$ 2) -1.9379×10^6 3) $474\,587.$ 4) $988\,723.$

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 2

Exercise 1

Consider the vectorial field $F(x,y,z)=($ $(-3x-1)\,y\,z\,e^{x y z}-3\,e^{x y z}+y^2,\ (-3x-1)\,x\,z\,e^{x y z}+2\,x\,y+3,\ (-3x-1)\,x\,y\,e^{x y z}$ $)$. Compute the potential function for this field whose potential at the origin is 4 .

. Calculate the value of the potential at the point $p=(10,-10,9)$.

1) $975-\frac{31}{e^{900}}-\frac{12}{5}\,\text{If}\left[\text{Floor}\left[975-\frac{31}{e^{900}}\right]==0,1,\text{Floor}[\text{solu}]\right]$ 2) $975-\frac{31}{e^{900}}-\text{If}\left[\text{Floor}\left[975-\frac{31}{e^{900}}\right]==0,1,\text{Floor}[\text{solu}]\right]$ 3) $975-\frac{31}{e^{900}}$ 4) $975-\frac{31}{e^{900}}-\frac{1}{2}\,\text{If}\left[\text{Floor}\left[975-\frac{31}{e^{900}}\right]==0,1,\text{Floor}[\text{solu}]\right]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi]\text{----}\!\!\to R^2$
$r(t)=\{(5t+5)\sin(2t)\,(4\cos(12t)+5),\ (2t+4)\sin(t)\}$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 185.027 2) 430.627 3) 614.827 4) 307.827

Exercise 3

Consider the vector field $F(x,y,z)=\{-x^2\,y\,z,\ 5\,x\,z^2,\ -8\,x^2\,y+2\,x\,y^2\,z^2\}$ and the surface

$S\equiv\left(\frac{5+x}{4}\right)^2+\left(\frac{1+y}{1}\right)^2+\left(\frac{2+z}{6}\right)^2=1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 3418.11 2) -9570.29 3) 6836.11 4) 0.105614

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 3

Exercise 1

Consider the vectorial field $F(x,y,z)=($ $-3x^2y^2z^2+2xy^2z^2(z-3x)-3y^2,\ 2x^2yz^2(z-3x)-6xy+2,\ x^2y^2z^2+2x^2y^2z(z-3x)$ $)$. Compute the potential function for this field whose potential at the origin is 3.

. Calculate the value of the potential at the point $p=(-7,-4,4)$.

1) $\frac{313931}{10}$ 2) $\frac{5336827}{5}$ 3) 313931 4) $\frac{4081103}{5}$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,2\pi]\dashrightarrow R^2$

$$r(t)=\left\{\frac{\left(\frac{1}{\sqrt{2}}-\frac{\sin(t)}{\sqrt{2}}\right)\cos(t)\,(2\cos(t)+3)}{\sin^2(t)+1},\ \frac{\left(\frac{\sin(t)}{\sqrt{2}}+\frac{1}{\sqrt{2}}\right)\cos(t)\,(2\cos(t)+3)}{\sin^2(t)+1}\right\}$$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 11.2336 2) 12.4336 3) 20.8336 4) 2.83363

Exercise 3

Consider the vector field $F(x,y,z)=$ $\{-7z-\mathrm{Sin}[y^2-z^2],\ -2z+\mathrm{Cos}[x^2-2z^2],\ 3xy+\mathrm{Cos}[2y^2]\}$ and the surface

$$S\equiv\left(\frac{8+x}{4}\right)^2+\left(\frac{7+y}{2}\right)^2+\left(\frac{-6+z}{7}\right)^2=1$$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) 1.6 2) -0.9 3) 2.4 4) 0.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 4

Exercise 1

Consider the vectorial field $F(x,y,z)=($ $y^2 z \sin(x y z) + 2x,\ x y z \sin(x y z) - \cos(x y z) - 4y,\ x y^2 \sin(x y z)$ $)$. Compute the potential function for this field whose potential at the origin is 2 .

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 1.18028 2) 2.18028 3) 0.780281 4) -1.41972

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi] \longrightarrow R^2$
$r(t)=\{(3t+5)\sin(2t)\,(2\cos(17t)+9),\ (9t+1)\sin(t)\,(2\cos(17t)+9)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 17001.5 2) 23801.9 3) 6800.88 4) 10201.1

Exercise 3

Consider the vector field $F(x,y,z)=\{-5 x y^2 z - 4 x y z^2,\ 9 x y z^2,\ 8x\}$ and the surface

$S \equiv \left(\frac{-9+x}{1}\right)^2 + \left(\frac{y}{6}\right)^2 + \left(\frac{5+z}{1}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 55824.8 2) -89317.6 3) 33495.2 4) 111649.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 5

Exercise 1

Consider the vectorial field $F(x,y,z) = \left((2y-z)\log(yz+1) - y\frac{z(2xy-xz)}{yz+1} + 2x\log(yz+1) - x, \frac{y(2xy-xz)}{yz+1} - x\log(yz+1) \right)$. Compute the potential function for this field whose potential at the origin is -3.

. Calculate the value of the potential at the point $p=(0,10,3)$.

1) 6   2) −3   3) $\frac{57}{10}$ 4) $\frac{9}{2}$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,2\pi] \dashrightarrow R^2$

$$r(t) = \left\{ \frac{\left(-\frac{\sin(t)}{\sqrt{2}} - \frac{1}{\sqrt{2}}\right)\cos(t)\,(6\cos(t)+8)}{\sin^2(t)+1}, \frac{\left(\frac{1}{\sqrt{2}} - \frac{\sin(t)}{\sqrt{2}}\right)\cos(t)\,(6\cos(t)+8)}{\sin^2(t)+1} \right\}$$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 170.103   2) 160.703   3) 94.9027   4) 76.1027

Exercise 3

Consider the vector field $F(x,y,z) =$
$\left\{4x + \text{Sin}\left[y^2 - 2z^2\right], e^{2x^2+z^2} - xz, e^{-x^2-2y^2} + 7y\right\}$ and the surface

$$S \equiv \left(\frac{-5+x}{3}\right)^2 + \left(\frac{-1+y}{3}\right)^2 + \left(\frac{-5+z}{4}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) −904.314   2) −1145.51   3) 603.186   4) −1205.81

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 6

Exercise 1

Consider the vectorial field $F(x,y,z)=(y^2,\ 2xy+3z\sin(yz)+z(3yz+3)\cos(yz),\ 3y\sin(yz)+y(3yz+3)\cos(yz))$. Compute the potential function for this field whose potential at the origin is -4.

. Calculate the value of the potential at the point $p=(-2,10,-10)$.

1) $-\frac{479}{2}+297\,\text{Sin}[100]$ 2) $222+297\,\text{Sin}[100]$

3) $\frac{2219}{2}+297\,\text{Sin}[100]$ 4) $-204+297\,\text{Sin}[100]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi]---\!\!\to R^2$

$r(t)=\{(9t+7)\sin(2t)(4\cos(19t)+10),\ (3t+7)\sin(t)(4\cos(19t)+10)\}$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 32940.9 2) 36600.9 3) 40260.9 4) 25620.9

Exercise 3

Consider the vector field $F(x,y,z)=\{-y^2z+8xy^2z^2,\ -1,\ 9y^2z-6xy^2z\}$ and the surface

$S\equiv\left(\frac{-4+x}{4}\right)^2+\left(\frac{-8+y}{2}\right)^2+\left(\frac{3+z}{9}\right)^2=1$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) -9.82214×10^6 2) $-727565.$ 3) 3.63783×10^6 4) 4.00161×10^6

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 7

Exercise 1

Consider the vectorial field $F(x,y,z) = (-4xy - 2\sin(yz), -2x^2 + (-2x-2)z\cos(yz) - 1, (-2x-2)y\cos(yz))$. Compute the potential function for this field whose potential at the origin is -2.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 1.64723 2) 7.24723 3) -13.5528 4) -3.55277

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,2\pi] ---\rightarrow R^2$

$$r(t) = \left\{ \frac{\left(\frac{1}{2} - \frac{1}{2}\sqrt{3}\sin(t)\right)\cos(t)\,(\cos(t)+3)}{\sin^2(t)+1}, \frac{\left(\frac{\sin(t)}{2} + \frac{\sqrt{3}}{2}\right)\cos(t)\,(\cos(t)+3)}{\sin^2(t)+1} \right\}$$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 7.15841 2) 5.35841 3) 16.1584 4) 9.85841

Exercise 3

Consider the vector field $F(x,y,z) = \{5 + 8x + \mathrm{Cos}[2z^2], -xy + 8xyz + \mathrm{Cos}[x^2 + 2z^2], -xyz + \mathrm{Cos}[x^2 + 2y^2]\}$ and the surface

$$S \equiv \left(\frac{9+x}{7}\right)^2 + \left(\frac{5+y}{4}\right)^2 + \left(\frac{-9+z}{3}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 71 357.8 2) 404 358. 3) -237 856. 4) -832 499.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 8

Exercise 1

Consider the vectorial field $F(x,y,z) = (z\,(x z - y z)\cos(x z) + z\sin(x z) - y, -z\sin(x z) - x, (x - y)\sin(x z) + x\,(x z - y z)\cos(x z))$. Compute the potential function for this field whose potential at the origin is 2.

. Calculate the value of the potential at the point $p = (-1, 5, 0)$.

1) $\frac{147}{10}$ 2) $\frac{14}{5}$ 3) $-\frac{133}{10}$ 4) 7

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] \longrightarrow R^2$
$r(t) = \{(6t+1)\sin(2t)(3\cos(18t)+10), (4t+9)\sin(t)(3\cos(18t)+10)\}$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 16114.5 2) 41436.5 3) 6906.54 4) 23020.5

Exercise 3

Consider the vector field $F(x,y,z) = \{-x y + 2x^2 y z, -x^2 y^2 + 3 x z, -2x^2 z\}$ and the surface

$S \equiv \left(\frac{-1+x}{9}\right)^2 + \left(\frac{7+y}{3}\right)^2 + \left(\frac{6+z}{1}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) −81956.2 2) 43135.3 3) 17254.3 4) 90583.8

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 9

Exercise 1

Consider the vectorial field $F(x,y,z)=($ $z\,e^{x y z}+y z\,(x z-3)\,e^{x y z},\ x z\,(x z-3)\,e^{x y z},\ x\,e^{x y z}+x y\,(x z-3)\,e^{x y z}$ $)$. Compute the potential function for this field whose potential at the origin is -6.

. Calculate the value of the potential at the point $p=(2,-5,5)$.

1) $\frac{57}{10}+\frac{7}{e^{50}}$ 2) $-3+\frac{7}{e^{50}}$ 3) $\frac{87}{10}+\frac{7}{e^{50}}$ 4) $6+\frac{7}{e^{50}}$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi]\longrightarrow R^2$
$r(t)=\{(6t+2)\sin(2t)\,(\cos(17t)+7),\ (4t+4)\sin(t)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 1960.92 2) 1153.82 3) 346.722 4) 692.622

Exercise 3

Consider the vector field $F(x,y,z)=\{6x^2yz^2,\ 7y^2z^2,\ -8x^2y^2z^2\}$ and the surface

$S\equiv\left(\frac{4+x}{9}\right)^2+\left(\frac{7+y}{4}\right)^2+\left(\frac{-3+z}{7}\right)^2=1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 1.59381×10^8 2) -7.96906×10^7 3) 1.51412×10^8 4) 2.31103×10^8

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 10

Exercise 1

Consider the vectorial field $F(x, y, z) = ($
$-4 x y^2 + 3 z e^{x z} + z e^{x z} (3 x z + 2), -4 x^2 y, 3 x e^{x z} + x e^{x z} (3 x z + 2)$
$)$. Compute the potential function for this field whose potential at the origin is 6.

. Calculate the value of the potential at the point $p = (-2, 4, 4)$.

1) $\frac{677}{2} - \frac{22}{e^8}$ 2) $-124 - \frac{22}{e^8}$ 3) $-574 - \frac{22}{e^8}$ 4) $-274 - \frac{22}{e^8}$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, 2\pi] ----\rightarrow R^2$

$$r(t) = \left\{ \frac{\left(-\frac{\sin(t)}{2} - \frac{\sqrt{3}}{2}\right) \cos(t) \, (9\cos(t) + 10)}{\sin^2(t) + 1}, \frac{\left(\frac{1}{2} - \frac{1}{2}\sqrt{3}\sin(t)\right) \cos(t) \, (9\cos(t) + 10)}{\sin^2(t) + 1} \right\}$$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 203.331 2) 135.731 3) 118.831 4) 169.531

Exercise 3

Consider the vector field $F(x,y,z) =$
$\{-\text{Sin}[y^2 + z^2], -9 y + \text{Cos}[2 x^2 - z^2], e^{-2 x^2 + y^2} + 4 y - 2 x z\}$ and the surface

$$S \equiv \left(\frac{1 + x}{3}\right)^2 + \left(\frac{-1 + y}{3}\right)^2 + \left(\frac{-7 + z}{8}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 5703.25 2) -4645.55 3) -9714.35 4) -2111.15

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 11

Exercise 1

Consider the vectorial field $F(x,y,z) = (-y z^2 \cos(x y z) - 4 x y, -2 x^2 - x z^2 \cos(x y z) + 2, -\sin(x y z) - x y z \cos(x y z))$. Compute the potential function for this field whose potential at the origin is -5.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 14.5854 2) −4.41462 3) −23.4146 4) 7.08538

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi] \longrightarrow R^2$

$r(t) = \left\{\sin(2t)\,(7\cos(t)+9)\left(\frac{\cos(t)}{\sqrt{2}} - \frac{\sin(t)}{\sqrt{2}}\right), \sin(2t)\,(7\cos(t)+9)\left(\frac{\sin(t)}{\sqrt{2}} + \frac{\cos(t)}{\sqrt{2}}\right)\right\}$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 66.4595 2) 82.8595 3) 33.6595 4) 148.46

Exercise 3

Consider the vector field $F(x,y,z) = \left\{x y + 8 x y z + \text{Cos}[y^2], e^{x^2-z^2}, -8 x + \text{Sin}[y^2]\right\}$ and the surface

$S \equiv \left(\frac{-4+x}{4}\right)^2 + \left(\frac{6+y}{8}\right)^2 + \left(\frac{9+z}{1}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) −74 230.7 2) −159 882. 3) 57 101.6 4) 274 085.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 12

Exercise 1

Consider the vectorial field $F(x,y,z)=\left(\frac{(-y-2)\,y\,z}{x\,y\,z+1}-3,\ \frac{x\,(-y-2)\,z}{x\,y\,z+1}-\log(x\,y\,z+1)-3,\ \frac{x\,(-y-2)\,y}{x\,y\,z+1}\right)$. Compute the potential function for this field whose potential at the origin is -4.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) -20.0931 2) -7.29309 3) -24.8931 4) -35.2931

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi]\longrightarrow R^2$

$r(t)=\{(3t+4)\sin(2t)\,(3\cos(8t)+10),\ (8t+6)\sin(t)\}$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 1095.23 2) 2627.53 3) 2189.73 4) 3503.13

Exercise 3

Consider the vector field $F(x,y,z)=\{-3xyz,\ 3xyz^2+7x^2yz^2,\ 8x^2y^2+9xyz\}$ and the surface

$S\equiv\left(\frac{7+x}{7}\right)^2+\left(\frac{2+y}{1}\right)^2+\left(\frac{-9+z}{1}\right)^2=1$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) 935146. 2) 2.43138×10^6 3) 2.99246×10^6 4) 4.20815×10^6

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 13

Exercise 1

Consider the vectorial field $F(x,y,z) = (y(-yz-z)\cos(xy) - 6xy^2, -6x^2y - z\sin(xy) + x(-yz-z)\cos(xy) + 3, (-y-1)\sin(xy))$. Compute the potential function for this field whose potential at the origin is -1.

. Calculate the value of the potential at the point $p=(6,-8,0)$.

1) $-\frac{6937}{10}$ 2) $-\frac{90181}{5}$ 3) $-\frac{55496}{5}$ 4) -6937

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi] \longrightarrow R^2$

$r(t) = \{(5t+7)\sin(2t)(2\cos(5t)+4), (2t+4)\sin(t)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 438.438 2) 625.938 3) 250.938 4) 938.438

Exercise 3

Consider the vector field $F(x,y,z) = \{7yz^2 - 5xyz^2, z - 3xy^2z^2, 6x - 3x^2\}$ and the surface

$S \equiv \left(\frac{-2+x}{6}\right)^2 + \left(\frac{y}{5}\right)^2 + \left(\frac{-5+z}{8}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 0.6 2) 1.6 3) -0.9 4) 0.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 14

Exercise 1

Consider the vectorial field $F(x, y, z) = \left(-4x, \frac{y z^2}{y z + 1} + z \log(y z + 1) + 2, \frac{y^2 z}{y z + 1} + y \log(y z + 1)\right)$. Compute the potential function for this field whose potential at the origin is -3.

. Calculate the value of the potential at the point $p = (-4, -10, -1)$.

1) $-167 + 10 \text{Log}[11]$ 2) $-\frac{179}{5} + 10 \text{Log}[11]$ 3) $-\frac{787}{5} + 10 \text{Log}[11]$ 4) $-55 + 10 \text{Log}[11]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, \pi] \longrightarrow R^2$
$r(t) = \{(4t + 7)\sin(2t)\,(4\cos(20t) + 4), (5t + 9)\sin(t)\,(4\cos(20t) + 4)\}$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 7321.58 2) 1464.78 3) 4393.18 4) 6589.48

Exercise 3

Consider the vector field $F(x,y,z) = \{-8 x y^2, 4 x y^2 z^2, -6 x^2 y^2 z\}$ and the surface

$S \equiv \left(\frac{-9 + x}{7}\right)^2 + \left(\frac{-4 + y}{3}\right)^2 + \left(\frac{-7 + z}{3}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 1.27218×10^6 2) $508872.$ 3) 5.72481×10^6 4) 5.34315×10^6

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 15

Exercise 1

Consider the vectorial field $F(x,y,z) = \left(-\frac{x y z^2}{x y z + 1} - z \log(x y z + 1) + 2,\ -\frac{x^2 z^2}{x y z + 1} - 2 y,\ -\frac{x^2 y z}{x y z + 1} - x \log(x y z + 1) \right)$. Compute the potential function for this field whose potential at the origin is -3.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 3.01914 2) 8.71914 3) 0.0191388 4) −2.38086

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, 2\pi] \dashrightarrow R^2$

$$r(t) = \left\{ \frac{\left(-\frac{\sin(t)}{\sqrt{2}} - \frac{1}{\sqrt{2}}\right) \cos(t)\, (2\cos(t) + 9)}{\sin^2(t) + 1},\ \frac{\left(\frac{1}{\sqrt{2}} - \frac{\sin(t)}{\sqrt{2}}\right) \cos(t)\, (2\cos(t) + 9)}{\sin^2(t) + 1} \right\}$$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 84.4336 2) 50.8336 3) 34.0336 4) 8.83363

Exercise 3

Consider the vector field $F(x,y,z) = \left\{ e^{2 y^2 - z^2},\ -8 x z + \mathrm{Cos}\left[x^2 - z^2\right],\ e^{-2 x^2 + 2 y^2} + 4 x y \right\}$ and the surface

$$S \equiv \left(\frac{-4 + x}{6}\right)^2 + \left(\frac{4 + y}{7}\right)^2 + \left(\frac{2 + z}{2}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) −0.8 2) 0. 3) −3.7 4) −1.8

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 16

Exercise 1

Consider the vectorial field $F(x, y, z) = (4x + z(yz + y), xz(z+1), xyz + x(yz + y))$. Compute the potential function for this field whose potential at the origin is -2.

. Calculate the value of the potential at the point $p = (-9, 0, -8)$.

1) 160   2) 592   3) 672   4) 544

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] \dashrightarrow R^2$
$r(t) = \{(4t+4)\sin(2t)(2\cos(17t)+10), (t+4)\sin(t)(2\cos(17t)+10)\}$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 2377.81   2) 3962.41   3) 6339.31   4) 7923.91

Exercise 3

Consider the vector field $F(x,y,z) = \{6x^2y^2z^2, -x^2 - yz, -2xy^2z^2\}$ and the surface

$$S \equiv \left(\frac{-9+x}{8}\right)^2 + \left(\frac{-6+y}{9}\right)^2 + \left(\frac{9+z}{5}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 3.16201×10^9 2) 7.5286×10^8 3) 2.55972×10^9 4) 2.78558×10^9

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 17

Exercise 1

Consider the vectorial field $F(x,y,z) = (-4xy - 5e^{yz} - 3, -2x^2 - 5xze^{yz}, -5xye^{yz})$. Compute the potential function for this field whose potential at the origin is -2.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) −1.52809 2) −11.9281 3) −7.12809 4) 16.8719

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,2\pi] \dashrightarrow R^2$

$$r(t) = \left\{ \frac{\left(\frac{1+\sqrt{3}}{2\sqrt{2}} - \frac{(\sqrt{3}-1)\sin(t)}{2\sqrt{2}}\right)\cos(t)\,(5\cos(t)+6)}{\sin^2(t)+1}, \frac{\left(\frac{(1+\sqrt{3})\sin(t)}{2\sqrt{2}} + \frac{\sqrt{3}-1}{2\sqrt{2}}\right)\cos(t)\,(5\cos(t)+6)}{\sin^2(t)+1} \right\}$$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 108.76 2) 57.4602 3) 68.8602 4) 97.3602

Exercise 3

Consider the vector field $F(x,y,z) = \{xy - 6xz + \text{Cos}[y^2 + z^2], 6x - 6xz - \text{Sin}[x^2 + z^2], e^{-x^2+2y^2} + 7x - 8xy\}$ and the surface

$$S \equiv \left(\frac{5+x}{3}\right)^2 + \left(\frac{5+y}{1}\right)^2 + \left(\frac{-6+z}{9}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) −7419.19 2) −1391.09 3) 9274.01 4) −4636.99

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 18

Exercise 1

Consider the vectorial field $F(x, y, z) = (2 x y^2 - z (z - y z) \sin(x z), 2 x^2 y - z \cos(x z), (1 - y) \cos(x z) - x (z - y z) \sin(x z))$. Compute the potential function for this field whose potential at the origin is 4 .

. Calculate the value of the potential at the point $p = (3, -1, -2)$.

1) $\frac{247}{10} - 4 \text{Cos}[6]$ 2) $\frac{301}{10} - 4 \text{Cos}[6]$ 3) $-\frac{16}{5} - 4 \text{Cos}[6]$ 4) $13 - 4 \text{Cos}[6]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, \pi] \longrightarrow R^2$
$r(t) = \{(6 t + 1) \sin(2 t) (5 \cos(9 t) + 6), (6 t + 2) \sin(t) (5 \cos(9 t) + 6)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 13195.4 2) 8247.19 3) 11546. 4) 3298.99

Exercise 3

Consider the vector field $F(x,y,z) = \{-x^2 z, -5 y^2 z + 6 x y^2 z^2, -6 x y^2 z^2\}$ and the surface

$S \equiv \left(\frac{x}{6}\right)^2 + \left(\frac{1 + y}{2}\right)^2 + \left(\frac{-3 + z}{5}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) -6030.38 2) 7539.82 3) 17340.5 4) 21863.9

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 19

Exercise 1

Consider the vectorial field $F(x,y,z) = (2y^2 z\cos(xyz) - 3y, 2\sin(xyz) + 2xyz\cos(xyz) - 3x + 2y, 2xy^2\cos(xyz))$. Compute the potential function for this field whose potential at the origin is 1 .

. Calculate the value of the potential at the point $p=(7,1,-8)$.

1) $-\frac{293}{5} - 2\,\mathrm{Sin}[56]$ 2) $-19 - 2\,\mathrm{Sin}[56]$ 3) $\frac{13}{5} - 2\,\mathrm{Sin}[56]$ 4) $-\frac{437}{5} - 2\,\mathrm{Sin}[56]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi] \longrightarrow R^2$
$r(t) = \{(3t+8)\sin(2t)(7\cos(5t)+9), (5t+2)\sin(t)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 2672.5 2) 713.399 3) 1247.7 4) 1782.

Exercise 3

Consider the vector field $F(x,y,z) = \{8xy^2 + 2xyz^2, -8y^2z^2, -8yz\}$ and the surface

$S \equiv \left(\frac{7+x}{6}\right)^2 + \left(\frac{-5+y}{9}\right)^2 + \left(\frac{1+z}{2}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) −14 801.1 2) 355 249. 3) 236 833. 4) 74 010.9

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 20

Exercise 1

Consider the vectorial field $F(x, y, z) = \left(10 x y^2 + \frac{y z (y z + 2 y)}{x y z + 1},\right.$
$10 x^2 y + \frac{x z (y z + 2 y)}{x y z + 1} + (z + 2) \log(x y z + 1), \frac{x y (y z + 2 y)}{x y z + 1} + y \log(x y z + 1)$
$\left.\right)$. Compute the potential function for this field whose potential at the origin is -2.
. Calculate the value of the potential at the point $p = (-5, -4, 0)$.

1) 1998 2) $\frac{45954}{5}$ 3) $\frac{999}{5}$ 4) $-\frac{2997}{5}$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, \pi] \longrightarrow R^2$
$r(t) = \{(4 t + 4) \sin(2 t) (5 \cos(15 t) + 5), (6 t + 4) \sin(t) (5 \cos(15 t) + 5)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 5755.68 2) 7194.48 3) 3597.48 4) 5036.28

Exercise 3

Consider the vector field $F(x,y,z) = \{0, -4 z, -7 x - 2 x^2 y z^2\}$ and the surface

$S \equiv \left(\frac{-5 + x}{5}\right)^2 + \left(\frac{-1 + y}{5}\right)^2 + \left(\frac{-4 + z}{1}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) $-231223.$ 2) -50265.5 3) 15080.3 4) -5026.08

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 21

Exercise 1

Consider the vectorial field $F(x, y, z) = (2x - 3y^2 + 3yz, z(3x + y) - 6xy + yz, y(3x + y))$. Compute the potential function for this field whose potential at the origin is 0 .

. Calculate the value of the potential at the point $p = (-6, -9, 6)$.

1) $\frac{72324}{5}$ 2) 2952 3) $-\frac{1476}{5}$ 4) $-\frac{8856}{5}$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] \longrightarrow R^2$
$r(t) = \{(5t + 3)\sin(2t)(\cos(14t) + 9), (9t + 5)\sin(t)(\cos(14t) + 9)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 23772.4 2) 16640.8 3) 19018. 4) 42790.

Exercise 3

Consider the vector field $F(x,y,z) = \{-4, -7y, -5xy^2\}$ and the surface

$S \equiv \left(\frac{1 + x}{3}\right)^2 + \left(\frac{-2 + y}{3}\right)^2 + \left(\frac{-7 + z}{4}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) −5173.98 2) 634.025 3) −1055.58 4) 106.025

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 22

Exercise 1

Consider the vectorial field $F(x, y, z) = (3 y z \cos(y z) + 2,$
$3 x z \cos(y z) - z (3 x y z + 2) \sin(y z), 3 x y \cos(y z) - y (3 x y z + 2) \sin(y z)$
). Compute the potential function for this field whose potential at the origin is -5.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 1.822 2) -3.778 3) -5.378 4) 4.622

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] \longrightarrow R^2$

$r(t) = \left\{\sin(2t)\,(9\cos(t) + 10)\left(-\frac{\sin(t)}{2} - \frac{1}{2}\sqrt{3}\cos(t)\right), \sin(2t)\,(9\cos(t) + 10)\left(\frac{\cos(t)}{2} - \frac{1}{2}\sqrt{3}\sin(t)\right)\right\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 88.3484 2) 132.348 3) 110.348 4) 66.3484

Exercise 3

Consider the vector field $F(x,y,z) =$
$\left\{7 z - 3 x z - \mathrm{Sin}\left[y^2\right], e^{-x^2-2 z^2} + 9 x y z, 8 z - 4 x y z + \mathrm{Cos}\left[2 x^2 + 2 y^2\right]\right\}$ and the surface

$$S \equiv \left(\frac{6 + x}{5}\right)^2 + \left(\frac{-1 + y}{7}\right)^2 + \left(\frac{9 + z}{9}\right)^2 = 1$$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) 1.00675×10^6 2) -791 020. 3) 719 111. 4) -287 643.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 23

Exercise 1

Consider the vectorial field $F(x, y, z) = \left(\frac{(-x-1)\,y\,z}{x\,y\,z+1} - \log(x\,y\,z+1),\ \frac{(-x-1)\,x\,z}{x\,y\,z+1},\ \frac{(-x-1)\,x\,y}{x\,y\,z+1}\right)$. Compute the potential function for this field whose potential at the origin is 3.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 2.81723 2) 1.61723 3) 10.4172 4) 2.61723

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi] \dashrightarrow R^2$
$r(t)=\{(5\,t+5)\sin(2\,t)\,(\cos(16\,t)+4),\ (8\,t+1)\sin(t)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 880.286 2) 1466.49 3) 1564.19 4) 977.986

Exercise 3

Consider the vector field $F(x,y,z) = \{3\,x^2\,y\,z + 4\,x\,y^2\,z,\ 6\,x^2 + 8\,x^2\,y\,z^2,\ 7 - 7\,x^2\,z^2\}$ and the surface

$S \equiv \left(\frac{5+x}{6}\right)^2 + \left(\frac{y}{1}\right)^2 + \left(\frac{-1+z}{1}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) −3623.42 2) −1449.02 3) −3261.02 4) −17394.6

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 24

Exercise 1

Consider the vectorial field $F(x,y,z) = (3x^3 y^4 z^4 + 3x^2 y^3 z^3 (3xyz-1) - 4xy$
$, 3x^4 y^3 z^4 + 3x^3 y^2 z^3 (3xyz-1) - 2x^2, 3x^4 y^4 z^3 + 3x^3 y^3 z^2 (3xyz-1)$
). Compute the potential function for this field whose potential at the origin is -3.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 8.67504 2) -3.32496 3) 10.275 4) 2.67504

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] ---\rightarrow R^2$

$r(t) = \left\{\sin(2t)\,(9\cos(t)+10)\left(-\frac{(\sqrt{3}-1)\sin(t)}{2\sqrt{2}} - \frac{(1+\sqrt{3})\cos(t)}{2\sqrt{2}}\right), \sin(2t)\,(9\cos(t)+10)\left(\frac{(\sqrt{3}-1)\cos(t)}{2\sqrt{2}} - \frac{(1\right.\right.$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 143.348 2) 33.3484 3) 110.348 4) 187.348

Exercise 3

Consider the vector field $F(x,y,z) =$
$\left\{-8x - 4xz - \mathrm{Sin}[2y^2 + 2z^2], e^{-2x^2+z^2}, e^{-2x^2+y^2}\right\}$ and the surface

$$S \equiv \left(\frac{-1+x}{3}\right)^2 + \left(\frac{-6+y}{5}\right)^2 + \left(\frac{-2+z}{1}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 2415.09 2) -1005.31 3) 2012.69 4) 503.69

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 25

Exercise 1

Consider the vectorial field $F(x,y,z) = (-2xy^2z^2 - 2y, -2x^2yz^2 - 2x - 1, -2x^2y^2z)$. Compute the potential function for this field whose potential at the origin is -5.

. Calculate the value of the potential at the point $p = (-7, -10, -2)$.

1) 3947 2) −11 841 3) −19 735 4) −23 682

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, 2\pi] \longrightarrow R^2$

$$r(t) = \left\{ \frac{\left(-\frac{\sin(t)}{2} - \frac{\sqrt{3}}{2}\right)\cos(t)\,(\cos(t)+7)}{\sin^2(t)+1},\ \frac{\left(\frac{1}{2} - \frac{1}{2}\sqrt{3}\sin(t)\right)\cos(t)\,(\cos(t)+7)}{\sin^2(t)+1} \right\}$$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 84.1584 2) 25.3584 3) 74.3584 4) 49.8584

Exercise 3

Consider the vector field $F(x,y,z) = \left\{e^{-2y^2} + 3xy - 8yz,\ e^{-x^2+2z^2} + 3y,\ 5xz - \mathrm{Sin}\left[x^2 + 2y^2\right]\right\}$ and the surface

$$S \equiv \left(\frac{9+x}{7}\right)^2 + \left(\frac{-4+y}{9}\right)^2 + \left(\frac{z}{4}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) −31 667.3 2) −38 000.9 3) 6334.35 4) −19 000.1

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 26

Exercise 1

Consider the vectorial field $F(x,y,z) = (-4 x y^2 z^2 e^{x y z} - 4 y z e^{x y z}, -4 x^2 y z^2 e^{x y z} - 4 x z e^{x y z}, -4 x^2 y^2 z e^{x y z} - 4 x y e^{x y z})$. Compute the potential function for this field whose potential at the origin is 3.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 5.31439 2) -4.88561 3) 6.71439 4) 2.31439

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] \longrightarrow R^2$

$r(t) = \left\{\sin(2t)\,(5\cos(t)+5)\left(\frac{1}{2}\sqrt{3}\cos(t) - \frac{\sin(t)}{2}\right), \sin(2t)\,(5\cos(t)+5)\left(\frac{1}{2}\sqrt{3}\sin(t) + \frac{\cos(t)}{2}\right)\right\}$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 41.0524 2) 29.4524 3) 43.9524 4) 12.0524

Exercise 3

Consider the vector field $F(x,y,z) = \left\{x z + \mathrm{Cos}[z^2], e^{2x^2-2z^2} + 8 x z, 5 x + \mathrm{Cos}[x^2]\right\}$ and the surface

$$S \equiv \left(\frac{1+x}{9}\right)^2 + \left(\frac{2+y}{1}\right)^2 + \left(\frac{4+z}{3}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 1178.41 2) -452.389 3) -1448.99 4) -1131.89

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 27

Exercise 1

Consider the vectorial field $F(x,y,z) = ($
$6xy^2 + 6yz^2\sin(xyz)$, $6x^2y + 6xz^2\sin(xyz)$, $6xyz\sin(xyz) - 6\cos(xyz)$
). Compute the potential function for this field whose potential at the origin is -3.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 12.415 2) −5.58498 3) −25.985 4) −3.18498

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] \longrightarrow R^2$
$r(t) = \{(t+4)\sin(2t)(6\cos(16t)+7),\ (9t+7)\sin(t)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 2101.55 2) 1106.15 3) 1769.75 4) 995.553

Exercise 3

Consider the vector field $F(x,y,z) = \{0,\ xz,\ y^2 - 7z^2\}$ and the surface

$S \equiv \left(\frac{x}{4}\right)^2 + \left(\frac{9+y}{5}\right)^2 + \left(\frac{-5+z}{1}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) −3518.31 2) 11 730.7 3) −25 805.3 4) −5864.31

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 28

Exercise 1

Consider the vectorial field $F(x, y, z) = (-4 x y^2 - 3 z \sin(x y z) + y z (y z - 3 x z) \cos(x y z) - 1, -4 x^2 y + z \sin(x y z) + x z (y z - 3 x z) \cos(x y z), (y - 3 x) \sin(x y z) + x y (y z - 3 x z) \cos(x y z))$. Compute the potential function for this field whose potential at the origin is -5.

. Calculate the value of the potential at the point $p = (2, -6, 6)$.

1) $-\frac{313}{2} + 72 \text{Sin}[72]$ 2) $-295 + 72 \text{Sin}[72]$ 3) $\frac{2126}{5} + 72 \text{Sin}[72]$ 4) $-\frac{6551}{10} + 72 \text{Sin}[72]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, 2\pi] ----\to R^2$

$$r(t) = \left\{ \frac{\left(\frac{1}{2} - \frac{1}{2}\sqrt{3}\sin(t)\right)\cos(t)\,(2\cos(t)+2)}{\sin^2(t)+1}, \frac{\left(\frac{\sin(t)}{2} + \frac{\sqrt{3}}{2}\right)\cos(t)\,(2\cos(t)+2)}{\sin^2(t)+1} \right\}$$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 8.13363 2) 7.43363 3) 13.0336 4) 3.23363

Exercise 3

Consider the vector field $F(x,y,z) =$
$\left\{-8 x - \text{Sin}[2 y^2], e^{-x^2-z^2} + 3 x z, 5 x y z + \text{Cos}[y^2]\right\}$ and the surface

$$S \equiv \left(\frac{-2 + x}{8}\right)^2 + \left(\frac{7 + y}{3}\right)^2 + \left(\frac{6 + z}{2}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 25 093. 2) −7841.33 3) −36 070.7 4) −15 682.8

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 29

Exercise 1

Consider the vectorial field $F(x,y,z) = \left(\frac{y z\,(-x z - 2 y)}{x y z + 1} - z \log(x y z + 1) + 6 x y \right.$ $, 3 x^2 + \frac{x z\,(-x z - 2 y)}{x y z + 1} - 2 \log(x y z + 1)\,,\ \frac{x y\,(-x z - 2 y)}{x y z + 1} - x \log(x y z + 1)$ $\left. \right)$. Compute the potential function for this field whose potential at the origin is -4.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) -10.0925 2) 3.50754 3) -3.69246 4) 7.50754

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,2\pi] ----\rightarrow R^2$

$$r(t) = \left\{ \frac{\left(\frac{\sqrt{3}-1}{2\sqrt{2}} - \frac{(1+\sqrt{3})\sin(t)}{2\sqrt{2}} \right) \cos(t)\ (9\cos(t)+10)}{\sin^2(t)+1},\ \frac{\left(\frac{(\sqrt{3}-1)\sin(t)}{2\sqrt{2}} + \frac{1+\sqrt{3}}{2\sqrt{2}} \right) \cos(t)\ (9\cos(t)+10)}{\sin^2(t)+1} \right\}$$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 135.731 2) 118.831 3) 169.531 4) 287.831

Exercise 3

Consider the vector field $F(x,y,z) =$
$\left\{4 - 5 y z + \mathrm{Cos}[2 y^2 + z^2],\ e^{2 x^2} - 6 x y,\ 8 + \mathrm{Cos}[x^2]\right\}$ and the surface

$$S \equiv \left(\frac{-1 + x}{4}\right)^2 + \left(\frac{7 + y}{2}\right)^2 + \left(\frac{5 + z}{4}\right)^2 = 1$$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) -2092.25 2) 644.752 3) 1449.75 4) -804.248

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 30

Exercise 1

Consider the vectorial field $F(x,y,z)=($
$-z\,(3x-3xy)\,\sin(xz)+(3-3y)\cos(xz)-1,\ -3x\cos(xz),\ -x\,(3x-3xy)\sin(xz)$
). Compute the potential function for this field whose potential at the origin is -2.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) -2.01045 2) 3.98955 3) -1.81045 4) -8.41045

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi]\longrightarrow R^2$

$r(t)=\left\{\sin(2t)\,(5\cos(t)+5)\left(-\frac{1}{2}\sqrt{3}\sin(t)-\frac{\cos(t)}{2}\right),\ \sin(2t)\,(5\cos(t)+5)\left(\frac{1}{2}\sqrt{3}\cos(t)-\frac{\sin(t)}{2}\right)\right\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 29.4524 2) 12.0524 3) 55.5524 4) 9.15243

Exercise 3

Consider the vector field $F(x,y,z)=$
$\{3+6xy+\mathrm{Cos}[y^2],\ -9xz-6xyz+\mathrm{Cos}[x^2+2z^2],\ y-\mathrm{Sin}[x^2]\}$ and the surface

$S\equiv\left(\frac{6+x}{1}\right)^2+\left(\frac{9+y}{8}\right)^2+\left(\frac{2+z}{7}\right)^2=1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) -127094. 2) -29556.1 3) -32511.8 4) 56159.2

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 31

Exercise 1

Consider the vectorial field $F(x,y,z) = (x^3 y^3 z^3 (3y + 3z) + 3x^2 y^3 z^3 (3xy + 3xz) - 2y^2, 3x^4 y^3 z^3 + 3x^3 y^2 z^3 (3xy + 3xz) - 4xy, 3x^4 y^3 z^3 + 3x^3 y^3 z^2 (3xy + 3xz))$. Compute the potential function for this field whose potential at the origin is -3.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) −18.8733 2) 9.52667 3) −3.27333 4) −4.07333

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, 2\pi] \longrightarrow R^2$

$$r(t) = \left\{ \frac{\left(-\frac{\sin(t)}{\sqrt{2}} - \frac{1}{\sqrt{2}}\right) \cos(t)\, (6\cos(t) + 8)}{\sin^2(t) + 1}, \frac{\left(\frac{1}{\sqrt{2}} - \frac{\sin(t)}{\sqrt{2}}\right) \cos(t)\, (6\cos(t) + 8)}{\sin^2(t) + 1} \right\}$$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 104.303 2) 132.503 3) 170.103 4) 94.9027

Exercise 3

Consider the vector field $F(x,y,z) =$
$\{e^{2y^2} - 2z + 6xyz, -7xy - 6xyz + \text{Cos}[2x^2 + z^2], -5yz + \text{Cos}[2x^2 + 2y^2]\}$ and the surface

$$S \equiv \left(\frac{-5 + x}{2}\right)^2 + \left(\frac{y}{3}\right)^2 + \left(\frac{-1 + z}{4}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) −32 021. 2) −6534.51 3) 14 377.5 4) −7841.51

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 32

Exercise 1

Consider the vectorial field $F(x, y, z) = (4x - 6xy^2, -6x^2y, 0)$. Compute the potential function for this field whose potential at the origin is 2.

. Calculate the value of the potential at the point $p = (3, 0, 5)$.

1) 100 2) −16 3) 20 4) 54

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, \pi] \longrightarrow R^2$
$r(t) = \{(2t + 4)\sin(2t)(6\cos(4t) + 6), (6t + 8)\sin(t)(6\cos(4t) + 6)\}$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 14077.4 2) 13071.9 3) 10055.4 4) 4022.38

Exercise 3

Consider the vector field $F(x,y,z) = \{5x^2 + 2xyz, 2xyz^2, -9y^2z\}$ and the surface

$$S \equiv \left(\frac{6+x}{1}\right)^2 + \left(\frac{5+y}{6}\right)^2 + \left(\frac{-1+z}{8}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 84510.5 2) −285223. 3) −528190. 4) −105638.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 33

Exercise 1

Consider the vectorial field $F(x, y, z) = (-2 y e^{x y z} + y z e^{x y z} (3 z - 2 x y) - 4 x y + 6 x , -2 x^2 - 2 x e^{x y z} + x z e^{x y z} (3 z - 2 x y) , x y e^{x y z} (3 z - 2 x y) + 3 e^{x y z})$. Compute the potential function for this field whose potential at the origin is 0 .

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 1.82972 2) 0.0297233 3) -1.57028 4) 2.02972

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] ----\to R^2$

$r(t) = \left\{\sin(2 t) (2 \cos(t) + 5) \left(-\frac{\sin(t)}{\sqrt{2}} - \frac{\cos(t)}{\sqrt{2}}\right), \sin(2 t) (2 \cos(t) + 5) \left(\frac{\cos(t)}{\sqrt{2}} - \frac{\sin(t)}{\sqrt{2}}\right)\right\}$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 6.50575 2) 21.2058 3) 4.40575 4) 35.9058

Exercise 3

Consider the vector field $F(x,y,z) = \left\{e^{2 y^2} + 9 x, -7 y + \mathrm{Cos}\left[2 x^2 + z^2\right], 8 x + 7 y z - \mathrm{Sin}\left[2 x^2 + y^2\right]\right\}$ and the surface

$S \equiv \left(\frac{-8 + x}{3}\right)^2 + \left(\frac{2 + y}{8}\right)^2 + \left(\frac{2 + z}{4}\right)^2 = 1$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) -4825.49 2) 11582.9 3) -5790.69 4) 3861.31

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 34

Exercise 1

Consider the vectorial field $F(x,y,z) = (2x^2y^2 + 2x(2x+2)y^2, 2x^2(2x+2)y, 0)$. Compute the potential function for this field whose potential at the origin is -1.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) -0.911111 2) -0.611111 3) -0.511111 4) -2.51111

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] \longrightarrow R^2$
$r(t) = \{(5t+7)\sin(2t)(4\cos(9t)+10), (2t+5)\sin(t)\}$

Indication: it is necessary to represent
 the curve to check whether it has intersection points.

1) 2503.62 2) 2837.42 3) 834.623 4) 1669.12

Exercise 3

Consider the vector field $F(x,y,z) = \{5xyz, -4yz^2, -6xz^2 + 8y^2z^2\}$ and the surface

$$S \equiv \left(\frac{5+x}{9}\right)^2 + \left(\frac{9+y}{7}\right)^2 + \left(\frac{2+z}{2}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) -4.52257×10^6 2) -1.40356×10^6 3) -1.55951×10^6 4) -2.02736×10^6

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 35

Exercise 1

Consider the vectorial field $F(x,y,z) = (6xy + 3z\cos(yz)$
$, 3x^2 - z(3xz+2)\sin(yz), 3x\cos(yz) - y(3xz+2)\sin(yz)$
). Compute the potential function for this field whose potential at the origin is 8 .

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) −26.0183 2) 28.8817 3) 9.08171 4) 41.4817

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,2\pi] \dashrightarrow R^2$

$$r(t) = \left\{ \frac{\left(-\frac{\sin(t)}{2} - \frac{\sqrt{3}}{2}\right)\cos(t)\,(9\cos(t)+10)}{\sin^2(t)+1}, \frac{\left(\frac{1}{2} - \frac{1}{2}\sqrt{3}\sin(t)\right)\cos(t)\,(9\cos(t)+10)}{\sin^2(t)+1} \right\}$$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 51.231 2) 169.531 3) 220.231 4) 17.431

Exercise 3

Consider the vector field $F(x,y,z) =$
$\{-4yz + 2xyz + \text{Cos}[2z^2], e^{2x^2-z^2} - 9yz, 3xy + 6yz + \text{Cos}[x^2]\}$ and the surface

$$S \equiv \left(\frac{1+x}{7}\right)^2 + \left(\frac{7+y}{6}\right)^2 + \left(\frac{-4+z}{5}\right)^2 = 1$$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) −542 215. 2) −117 873. 3) −377 193. 4) 341 832.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 36

Exercise 1

Consider the vectorial field $F(x,y,z) = (6xy + (3-2z)\sin(yz), 3x^2 + z(3x-2xz)\cos(yz) + 6y, y(3x-2xz)\cos(yz) - 2x\sin(yz))$. Compute the potential function for this field whose potential at the origin is -3.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) −8.49881 2) 6.30119 3) −1.29881 4) −3.49881

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,2\pi] \longrightarrow R^2$

$$r(t) = \left\{ \frac{\left(\frac{1}{2} - \frac{1}{2}\sqrt{3}\sin(t)\right)\cos(t)\,(8\cos(t)+8)}{\sin^2(t)+1}, \frac{\left(\frac{\sin(t)}{2} + \frac{\sqrt{3}}{2}\right)\cos(t)\,(8\cos(t)+8)}{\sin^2(t)+1} \right\}$$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 189.738 2) 12.7381 3) 71.7381 4) 118.938

Exercise 3

Consider the vector field $F(x,y,z) = \{2xy + \mathrm{Cos}[2y^2 + z^2], 3 + 3xz - \mathrm{Sin}[x^2], e^{-2y^2} + 9xy + z\}$ and the surface

$$S \equiv \left(\frac{-3+x}{8}\right)^2 + \left(\frac{y}{8}\right)^2 + \left(\frac{-5+z}{8}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) −6002.54 2) 9863.06 3) 4503.06 4) 2144.66

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 37

Exercise 1

Consider the vectorial field $F(x, y, z) = (2 x y^2 - 2, 2 x^2 y - (-y-3) z \sin(y z) - \cos(y z), -((-y-3) y \sin(y z)))$. Compute the potential function for this field whose potential at the origin is -6.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) −1.58684 2) −7.98684 3) 0.0131642 4) −7.18684

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] ----\to R^2$

$r(t) = \{(3t+1)\sin(2t)(7\cos(20t)+9), (9t+4)\sin(t)\}$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 1441.65 2) 393.647 3) 1310.65 4) 1048.65

Exercise 3

Consider the vector field $F(x,y,z) = \{4 x z, 5 x y^2 z, 2 x y^2 z^2\}$ and the surface

$$S \equiv \left(\frac{7+x}{8}\right)^2 + \left(\frac{8+y}{7}\right)^2 + \left(\frac{9+z}{2}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 634359. 2) 1.90308×10^6 3) 6.97794×10^6 4) 6.34358×10^6

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 38

Exercise 1

Consider the vectorial field $F(x,y,z)=(-y\,(3xz-z)\sin(xy)+3z\cos(xy)-3y^2+2y,\ -x\,(3xz-z)\sin(xy)-6xy+2x,\ (3x-1)\cos(xy))$. Compute the potential function for this field whose potential at the origin is -1.

. Calculate the value of the potential at the point $p=(9,8,10)$.

1) $\frac{26978}{5}+260\,\mathrm{Cos}[72]$ 2) $-\frac{13436}{5}+260\,\mathrm{Cos}[72]$ 3) $-1585+260\,\mathrm{Cos}[72]$ 4) $-\frac{29969}{5}+260\,\mathrm{Cos}[72]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,2\pi]\longrightarrow R^2$

$$r(t)=\left\{\frac{\left(\frac{\sqrt{3}}{2}-\frac{\sin(t)}{2}\right)\cos(t)\,(9\cos(t)+9)}{\sin^2(t)+1},\ \frac{\left(\frac{1}{2}\sqrt{3}\sin(t)+\frac{1}{2}\right)\cos(t)\,(9\cos(t)+9)}{\sin^2(t)+1}\right\}$$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 30.531 2) 180.531 3) 150.531 4) 255.531

Exercise 3

Consider the vector field $F(x,y,z)=\left\{9xy+2z-\mathrm{Sin}[z^2],\ e^{-2x^2+z^2}+2xy-9xyz,\ -5z+5xz+\mathrm{Sin}[x^2-2y^2]\right\}$ and the surface

$$S\equiv\left(\frac{x}{8}\right)^2+\left(\frac{7+y}{9}\right)^2+\left(\frac{-9+z}{5}\right)^2=1$$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) $-164067.$ 2) $287118.$ 3) $-348642.$ 4) $-102542.$

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 39

Exercise 1

Consider the vectorial field $F(x, y, z) = ($
$y(-z)(-2xyz - 3xy)\sin(xyz) + (-2yz - 3y)\cos(xyz) - 3y,$
$x(-z)(-2xyz - 3xy)\sin(xyz) + (-2xz - 3x)\cos(xyz) - 3x - 2y$
$, -xy(-2xyz - 3xy)\sin(xyz) - 2xy\cos(xyz)$
$)$. Compute the potential function for this field whose potential at the origin is 1 .

. Calculate the value of the potential at the point $p = (8, -10, -2)$.

1) $\frac{1143}{5} - 80\,\text{Cos}[160]$ 2) $-\frac{999}{10} - 80\,\text{Cos}[160]$ 3) $141 - 80\,\text{Cos}[160]$ 4) $-\frac{828}{5} - 80\,\text{Cos}[160]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, \pi] \text{-----}\!\!\to R^2$

$r(t) = \left\{\sin(2t)(8\cos(t) + 8)\left(\frac{(1+\sqrt{3})\cos(t)}{2\sqrt{2}} - \frac{(\sqrt{3}-1)\sin(t)}{2\sqrt{2}}\right), \sin(2t)(8\cos(t) + 8)\left(\frac{(1+\sqrt{3})\sin(t)}{2\sqrt{2}} + \frac{(\sqrt{3}-\right.\right.$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 75.3982 2) 60.3982 3) 82.8982 4) 105.398

Exercise 3

Consider the vector field $F(x,y,z) =$
$\{2 + \text{Sin}[y^2], 8x + \text{Cos}[2x^2 + 2z^2], 6xz + \text{Sin}[2x^2 - 2y^2]\}$ and the surface

$S \equiv \left(\frac{9 + x}{1}\right)^2 + \left(\frac{-8 + y}{5}\right)^2 + \left(\frac{7 + z}{3}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 339.38 2) 1357.28 3) -3392.92 4) -4750.12

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 40

Exercise 1

Consider the vectorial field $F(x,y,z)=\left(\frac{y(-3xz-2y)}{xy+1}-3z\log(xy+1)+3y, \frac{x(-3xz-2y)}{xy+1}-2\log(xy+1)+3x+6y, -3x\log(xy+1)\right)$. Compute the potential function for this field whose potential at the origin is -5.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 2.27297 2) -3.72703 3) -14.527 4) 9.07297

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi]---\to R^2$

$r(t)=\{(6t+3)\sin(2t)(5\cos(7t)+10), (2t+2)\sin(t)(5\cos(7t)+10)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 13957.1 2) 14954. 3) 9969.49 4) 17944.7

Exercise 3

Consider the vector field $F(x,y,z)=\{2xy^2z^2, 3x^2y^2z^2, -2yz\}$ and the surface

$S\equiv\left(\frac{5+x}{6}\right)^2+\left(\frac{5+y}{3}\right)^2+\left(\frac{-1+z}{1}\right)^2=1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) -299267. 2) -80882.9 3) 177943. 4) 40441.6

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 41

Exercise 1

Consider the vectorial field $F(x, y, z) = (z e^{xyz} + y z e^{xyz} (x z + 2 y), x z e^{xyz} (x z + 2 y) + 2 e^{xyz} - 3, x e^{xyz} + x y e^{xyz} (x z + 2 y))$. Compute the potential function for this field whose potential at the origin is 1.

. Calculate the value of the potential at the point $p = (1, -8, -8)$.

1) $-179\,572\,293\,527\,374\,566\,227\,786\,074\,763 - 24 e^{64}$ 2) $224\,465\,366\,909\,218\,207\,784\,732\,593\,510 - 24 e^{64}$ 3) $25 - 24 e^{64}$ 4) $419\,002\,018\,230\,540\,654\,531\,500\,841\,197 - 24 e^{64}$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, \pi] \longrightarrow R^2$

$r(t) = \{(6t + 2)\sin(2t)(3\cos(8t) + 9), (5t + 9)\sin(t)(3\cos(8t) + 9)\}$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 31 972.3 2) 36 539.7 3) 13 702.7 4) 22 837.5

Exercise 3

Consider the vector field $F(x,y,z) = \{-8x^2 z, -7yz, -8x + 7x^2 y\}$ and the surface

$$S \equiv \left(\frac{2+x}{6}\right)^2 + \left(\frac{-4+y}{9}\right)^2 + \left(\frac{-7+z}{7}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 609 594. 2) −138 544. 3) −498 758. 4) 277 088.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 42

Exercise 1

Consider the vectorial field $F(x,y,z)=($
$y\,e^{xy}\,(y\,z+y)+6\,x+2\,y\,,\,x\,e^{xy}\,(y\,z+y)+(z+1)\,e^{xy}+2\,x\,,\,y\,e^{xy}$
$)$. Compute the potential function for this field whose potential at the origin is 5 .

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 18.0774 2) 15.9774 3) 7.57742 4) 10.3774

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi]\longrightarrow R^2$
$r(t)=\{(4\,t+3)\,\sin(2\,t)\,(3\cos(12\,t)+10),\,(3\,t+7)\,\sin(t)\,(3\cos(12\,t)+10)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 23346.5 2) 10895.3 3) 15564.5 4) 28015.7

Exercise 3

Consider the vector field $F(x,y,z)=\{3\,z,\,8\,x^2\,y^2\,z+8\,x\,y^2\,z^2,\,x^2\,y^2\,z^2\}$ and the surface

$S\equiv\left(\frac{-9+x}{7}\right)^2+\left(\frac{-1+y}{3}\right)^2+\left(\frac{z}{7}\right)^2=1$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) 868949. 2) 1.21653×10^6 3) 2.17237×10^6 4) 1.91169×10^6

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 43

Exercise 1

Consider the vectorial field $F(x,y,z) = (3\sin(xyz) + yz\,(3x-3z)\cos(xyz)$ $, xz\,(3x-3z)\cos(xyz) - 4y + 3, xy\,(3x-3z)\cos(xyz) - 3\sin(xyz)$). Compute the potential function for this field whose potential at the origin is -4.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) -3.16667 2) 12.0333 3) 10.0333 4) 2.43333

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi] \longrightarrow R^2$
$r(t) = \{(2t+1)\sin(2t)\,(2\cos(6t)+9),\ (9t+5)\sin(t)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 972.111 2) 388.911 3) 486.111 4) 1166.51

Exercise 3

Consider the vector field $F(x,y,z) = \{3y^2 z,\ 7x^2 y^2 - 5yz^2,\ -8x^2 y^2 z + 6xz^2\}$ and the surface

$$S \equiv \left(\frac{-3+x}{8}\right)^2 + \left(\frac{6+y}{5}\right)^2 + \left(\frac{-1+z}{3}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 1.24042×10^7 2) -4.43005×10^6 3) 1.01891×10^7 4) 1.77202×10^6

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 44

Exercise 1

Consider the vectorial field $F(x, y, z) = (2x, 0, 0)$. Compute the potential function for this field whose potential at the origin is 3 .

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) −6.26667 2) −6.56667 3) 3.33333 4) 9.33333

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, 2\pi] \dashrightarrow R^2$

$$r(t) = \left\{ \frac{\left(-\frac{(1+\sqrt{3})\sin(t)}{2\sqrt{2}} - \frac{\sqrt{3}-1}{2\sqrt{2}}\right)\cos(t)\,(6\cos(t)+8)}{\sin^2(t)+1}, \frac{\left(\frac{1+\sqrt{3}}{2\sqrt{2}} - \frac{(\sqrt{3}-1)\sin(t)}{2\sqrt{2}}\right)\cos(t)\,(6\cos(t)+8)}{\sin^2(t)+1} \right\}$$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 160.703 2) 38.5027 3) 94.9027 4) 19.7027

Exercise 3

Consider the vector field $F(x,y,z) = \{3xyz - \text{Sin}[2y^2 - z^2], -5 - 3z + \text{Cos}[x^2], 6xy - \text{Sin}[x^2 - y^2]\}$ and the surface

$$S \equiv \left(\frac{-4+x}{9}\right)^2 + \left(\frac{2+y}{7}\right)^2 + \left(\frac{9+z}{4}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) −125 402. 2) −131 102. 3) 171 003. 4) 57 001.1

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 45

Exercise 1

Consider the vectorial field $F(x, y, z) = ($
$2 \sin(x y z) + 2 x y z \cos(x y z) - 6 x y, 2 x^2 z \cos(x y z) - 3 x^2 + 1, 2 x^2 y \cos(x y z)$
$)$. Compute the potential function for this field whose potential at the origin is 4 .

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 0.962565 2) 8.16257 3) -1.43743 4) 4.16257

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi] \dashrightarrow R^2$
$r(t) = \{(5 t + 8) \sin(2 t) (7 \cos(9 t) + 9), (5 t + 3) \sin(t)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 3992.44 2) 2883.44 3) 3548.84 4) 2218.04

Exercise 3

Consider the vector field $F(x,y,z) = \{9 x z - 8 y^2 z^2, 2 y - 7 x y^2, -8 y^2\}$ and the surface

$S \equiv \left(\frac{5 + x}{4}\right)^2 + \left(\frac{-5 + y}{5}\right)^2 + \left(\frac{3 + z}{8}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 435 634. 2) 217 817. 3) -87 126.7 4) 43 563.5

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 46

Exercise 1

Consider the vectorial field $F(x,y,z) = ($ $y z (x + 2 y) e^{x y z} + e^{x y z} + 3 y^2, 2 e^{x y z} + x z (x + 2 y) e^{x y z} + 6 x y, x y (x + 2 y) e^{x y z}$ $)$. Compute the potential function for this field whose potential at the origin is -2.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 0.298861 2) 0.798861 3) 3.89886 4) -0.301139

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,2\pi] ----\to R^2$

$$r(t) = \left\{ \frac{\left(-\frac{(\sqrt{3}-1)\sin(t)}{2\sqrt{2}} - \frac{1+\sqrt{3}}{2\sqrt{2}}\right)\cos(t)\,(3\cos(t)+7)}{\sin^2(t)+1}, \frac{\left(\frac{\sqrt{3}-1}{2\sqrt{2}} - \frac{(1+\sqrt{3})\sin(t)}{2\sqrt{2}}\right)\cos(t)\,(3\cos(t)+7)}{\sin^2(t)+1} \right\}$$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 67.9257 2) 56.7257 3) 101.526 4) 73.5257

Exercise 3

Consider the vector field $F(x,y,z) =$ $\{-9 x - 3 x y z - \mathrm{Sin}[2 y^2 - z^2], e^{-x^2} + 2 x y - 9 x z, -4 x - 3 y + \mathrm{Cos}[x^2 + y^2]\}$ and the surface

$$S \equiv \left(\frac{7 + x}{7}\right)^2 + \left(\frac{-9 + y}{2}\right)^2 + \left(\frac{-7 + z}{2}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) -114379. 2) -24864.7 3) -37297.2 4) -9945.66

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 47

Exercise 1

Consider the vectorial field $F(x,y,z) = (-4xyz^2 \sin(xyz) + 4z\cos(xyz) - 1$ $, -4x^2z^2\sin(xyz) - 3 , 4x\cos(xyz) - 4x^2yz\sin(xyz)$ $)$. Compute the potential function for this field whose potential at the origin is -2.

. Calculate the value of the potential at the point $p=(-6,6,9)$.

1) $-\frac{2083}{5} - 216\,\text{Cos}[324]$ 2) $-563 - 216\,\text{Cos}[324]$

3) $-14 - 216\,\text{Cos}[324]$ 4) $\frac{2309}{5} - 216\,\text{Cos}[324]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,2\pi]\text{----}\to R^2$

$$r(t) = \left\{ \frac{\left(\frac{\sqrt{3}}{2} - \frac{\sin(t)}{2}\right)\cos(t)\,(8\cos(t)+8)}{\sin^2(t)+1} , \frac{\left(\frac{1}{2}\sqrt{3}\sin(t) + \frac{1}{2}\right)\cos(t)\,(8\cos(t)+8)}{\sin^2(t)+1} \right\}$$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 118.938 2) 24.5381 3) 59.9381 4) 201.538

Exercise 3

Consider the vector field $F(x,y,z) =$
$\left\{-5yz - \text{Sin}[2y^2],\ e^{x^2-z^2} - 3xy,\ -12yz + \text{Cos}[2x^2 - 2y^2]\right\}$ and the surface

$$S \equiv \left(\frac{-4+x}{8}\right)^2 + \left(\frac{5+y}{1}\right)^2 + \left(\frac{6+z}{3}\right)^2 = 1$$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) 4825.49 2) -9649.51 3) 17 370.5 4) -5789.51

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 48

Exercise 1

Consider the vectorial field $F(x, y, z) = (-4 x y^2 - y z (y z - 2 y) \sin(x y z) + 1,$ $-4 x^2 y - x z (y z - 2 y) \sin(x y z) + (z - 2) \cos(x y z), y \cos(x y z) - x y (y z - 2 y) \sin(x y z)$). Compute the potential function for this field whose potential at the origin is -3.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) -10.6552 2) 3.34482 3) -3.45518 4) -1.05518

Exercise 2

Compute the area of the domain whose boundary is the curve

$r : [0,\pi] \longrightarrow R^2$
$r(t) = \{(4 t + 4) \sin(2 t) (5 \cos(8 t) + 9), (t + 6) \sin(t) (5 \cos(8 t) + 9)\}$

Indication: it is necessary to represent
  the curve to check whether it has intersection points.

1) 2957.08 2) 14781.9 3) 4927.88 4) 9854.88

Exercise 3

Consider the vector field $F(x,y,z) = \{4 y + 2 y z^2, -5 x^2 z + 2 x z^2, -4 z^2 + 9 x y z^2\}$ and the surface

$S \equiv \left(\frac{3 + x}{5}\right)^2 + \left(\frac{8 + y}{4}\right)^2 + \left(\frac{-5 + z}{3}\right)^2 = 1$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) $213126.$ 2) $-372970.$ 3) $532814.$ 4) 1.49188×10^6

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 49

Exercise 1

Consider the vectorial field $F(x,y,z)=(3yz+y+2, z(3x+yz)+x+yz^2, y(3x+yz)+y^2z)$. Compute the potential function for this field whose potential at the origin is 4 .

. Calculate the value of the potential at the point $p=(-4,-5,-5)$.

1) 341 2) $-\frac{7161}{10}$ 3) $\frac{13981}{10}$ 4) $\frac{341}{2}$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,2\pi]---\to R^2$

$$r(t)=\left\{\frac{\left(-\frac{\sin(t)}{\sqrt{2}}-\frac{1}{\sqrt{2}}\right)\cos(t)\,(4\cos(t)+10)}{\sin^2(t)+1},\frac{\left(\frac{1}{\sqrt{2}}-\frac{\sin(t)}{\sqrt{2}}\right)\cos(t)\,(4\cos(t)+10)}{\sin^2(t)+1}\right\}$$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 147.635 2) 57.2345 3) 113.735 4) 181.535

Exercise 3

Consider the vector field $F(x,y,z)=$
$\{6y+\mathrm{Cos}[y^2+z^2], -8xy+\mathrm{Cos}[2z^2], 6xz+\mathrm{Cos}[2x^2+2y^2]\}$ and the surface

$$S\equiv\left(\frac{6+x}{2}\right)^2+\left(\frac{y}{3}\right)^2+\left(\frac{3+z}{4}\right)^2=1$$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) 4944.97 2) -2532.23 3) 1206.37 4) 603.372

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 50

Exercise 1

Consider the vectorial field $F(x,y,z)=(0,-4y,0)$. Compute the potential function for this field whose potential at the origin is -2.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) −13.7667 2) −5.06667 3) −2.66667 4) 6.03333

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi]\longrightarrow R^2$

$r(t)=\{\sin(2t)\,(9\cos(t)+10)\left(\frac{(1+\sqrt{3})\cos(t)}{2\sqrt{2}}-\frac{(\sqrt{3}-1)\sin(t)}{2\sqrt{2}}\right),\ \sin(2t)\,(9\cos(t)+10)\left(\frac{(1+\sqrt{3})\sin(t)}{2\sqrt{2}}+\frac{(\sqrt{}}{}\right.$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 198.348 2) 110.348 3) 143.348 4) 33.3484

Exercise 3

Consider the vector field $F(x,y,z)=\{3xz+6xyz+\mathrm{Sin}[y^2-2z^2],\ -9z+3xz-\mathrm{Sin}[x^2+z^2],\ 6xz-\mathrm{Sin}[x^2+2y^2]\}$ and the surface

$$S\equiv\left(\frac{-8+x}{2}\right)^2+\left(\frac{6+y}{9}\right)^2+\left(\frac{8+z}{5}\right)^2=1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) −223 480. 2) 552 819. 3) 211 718. 4) 117 621.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 51

Exercise 1

Consider the vectorial field $F(x, y, z) = ($

$$6 x y^2 + \frac{y z (z+2)}{x y z + 1}, 6 x^2 y + \frac{x z (z+2)}{x y z + 1}, \frac{x y (z+2)}{x y z + 1} + \log(x y z + 1)$$

). Compute the potential function for this field whose potential at the origin is 0 .

. Calculate the value of the potential at the point $p = (-3, 3, -1)$.

1) $-100 + \text{Log}[10]$ 2) $-\frac{837}{2} + \text{Log}[10]$ 3) $-296 + \text{Log}[10]$ 4) $243 + \text{Log}[10]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, \pi] \longrightarrow R^2$

$r(t) = \{(9t + 6)\sin(2t)\ (9\cos(17t) + 9), (7t + 8)\sin(t)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 967.718 2) 2419.12 3) 8708.52 4) 4838.12

Exercise 3

Consider the vector field $F(x,y,z) = \{8 x z + 6 x y z, -6 x^2 y^2 z, 8 x^2 y^2 z\}$ and the surface

$$S \equiv \left(\frac{1+x}{4}\right)^2 + \left(\frac{-9+y}{9}\right)^2 + \left(\frac{-7+z}{7}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) -514 564. 2) -171 521. 3) -728 966. 4) 428 805.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 52

Exercise 1

Consider the vectorial field $F(x, y, z) = (6xy - 3y, 3x^2 - 3x - yz\sin(yz) + \cos(yz), -y^2\sin(yz))$. Compute the potential function for this field whose potential at the origin is 4 .

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) -4.1903 2) -7.3903 3) -9.3903 4) 4.2097

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] \longrightarrow R^2$
$r(t) = \{ (3t+9)\sin(2t)(2\cos(6t)+5), (3t+4)\sin(t)(2\cos(6t)+5) \}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 7504.39 2) 8387.19 3) 2648.99 4) 4414.59

Exercise 3

Consider the vector field $F(x,y,z) = \{3x^2y^2, 3x^2y^2 - 2xz^2, 0\}$ and the surface

$S \equiv (\frac{-9+x}{2})^2 + (\frac{9+y}{7})^2 + (\frac{z}{8})^2 = 1$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) -433207. 2) -547209. 3) -250804. 4) 228004.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 53

Exercise 1

Consider the vectorial field $F(x,y,z)=\left(-\frac{y^2 z}{x y z+1}-4 x y,\ -2 x^2-\frac{x y z}{x y z+1}-\log(x y z+1)+4 y,\ -\frac{x y^2}{x y z+1}\right)$. Compute the potential function for this field whose potential at the origin is -3.

. Calculate the value of the potential at the point $p=(7,-3,-6)$.

1) $\frac{4452}{5}+3\,\text{Log}[127]$ 2) $\frac{8581}{10}+3\,\text{Log}[127]$ 3) $309+3\,\text{Log}[127]$ 4) $\frac{11811}{10}+3\,\text{Log}[127]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi]\longrightarrow R^2$

$r(t)=\{(5t+5)\sin(2t)\,(3\cos(8t)+9),\ (3t+7)\sin(t)\,(3\cos(8t)+9)\}$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 22 901. 2) 7046.63 3) 17 616.2 4) 26 424.2

Exercise 3

Consider the vector field $F(x,y,z)=\{5y^2z^2-6x^2y^2z^2,\ 9y,\ 5z^2\}$ and the surface

$S\equiv\left(\frac{x}{5}\right)^2+\left(\frac{4+y}{6}\right)^2+\left(\frac{-4+z}{9}\right)^2=1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 205 044. 2) 155 168. 3) 149 627. 4) 55 417.7

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 54

Exercise 1

Consider the vectorial field $F(x,y,z) = (y z e^{x y z} (-x y z - 3 y) - y z e^{x y z}, (-x z - 3) e^{x y z} + x z e^{x y z} (-x y z - 3 y) - 1, x y e^{x y z} (-x y z - 3 y) - x y e^{x y z})$. Compute the potential function for this field whose potential at the origin is 1.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) -5.67026 2) -1.47026 3) 4.12974 4) 6.32974

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi] \longrightarrow R^2$

$r(t) = \left\{\sin(2t)\,(6\cos(t)+6)\left(\frac{\cos(t)}{2} - \frac{1}{2}\sqrt{3}\sin(t)\right), \sin(2t)\,(6\cos(t)+6)\left(\frac{\sin(t)}{2} + \frac{1}{2}\sqrt{3}\cos(t)\right)\right\}$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 42.4115 2) 55.0115 3) 71.8115 4) 46.6115

Exercise 3

Consider the vector field $F(x,y,z) = \left\{5 x y + 8 x z + \mathrm{Sin}\left[y^2 + z^2\right], e^{x^2} - 5 x y z, 4 + e^{-2 y^2}\right\}$ and the surface

$$S \equiv \left(\frac{-2+x}{1}\right)^2 + \left(\frac{-7+y}{6}\right)^2 + \left(\frac{-7+z}{9}\right)^2 = 1$$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) -13774.9 2) 4750.09 3) 14725.1 4) -8549.91

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 55

Exercise 1

Consider the vectorial field $F(x, y, z) = (0, 3z^2 e^{yz}, 3yz e^{yz} + 3e^{yz})$. Compute the potential function for this field whose potential at the origin is 5.

. Calculate the value of the potential at the point $p = (3, -10, -4)$.

1) $5 - 12e^{40}$ 2) $-8473869606132719455 - 12e^{40}$ 3) $-1694773921226543887 - 12e^{40}$ 4) $7061558005110599555 - 12e^{40}$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r : [0, \pi] \longrightarrow R^2$
$r(t) = \{-(\sin(t)\sin(2t)(8\cos(t) + 10)), \sin(2t)\cos(t)(8\cos(t) + 10)\}$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 134.573 2) 144.873 3) 103.673 4) 21.2726

Exercise 3

Consider the vector field $F(x,y,z) = \left\{5xz + \mathrm{Cos}[2y^2 + 2z^2], -yz + \mathrm{Cos}[2x^2 + 2z^2], 8 + e^{-x^2-2y^2} - x\right\}$ and the surface

$$S \equiv \left(\frac{-6 + x}{3}\right)^2 + \left(\frac{3 + y}{8}\right)^2 + \left(\frac{-6 + z}{2}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) −7237.01 2) 19300.5 3) 4825.49 4) 7720.49

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 56

Exercise 1

Consider the vectorial field $F(x,y,z) = (x y^2 e^{x y} + y e^{x y}, x^2 y e^{x y} + x e^{x y}, 0)$. Compute the potential function for this field whose potential at the origin is -1.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) −3.09962 2) −0.59962 3) 2.30038 4) 2.80038

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] \longrightarrow R^2$

$r(t) = \{\sin(2t)\ (4\cos(t)+8)\left(-\frac{(1+\sqrt{3})\sin(t)}{2\sqrt{2}} - \frac{(\sqrt{3}-1)\cos(t)}{2\sqrt{2}}\right), \sin(2t)\ (4\cos(t)+8)\left(\frac{(1+\sqrt{3})\cos(t)}{2\sqrt{2}} - \frac{(\sqrt{3}}{}\right.$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 34.1487 2) 17.3487 3) 22.9487 4) 56.5487

Exercise 3

Consider the vector field $F(x,y,z) = \{4z - \sin[2y^2], -5xy - \sin[2x^2], -5y - 5xy + \cos[2x^2]\}$ and the surface

$$S \equiv \left(\frac{-8+x}{8}\right)^2 + \left(\frac{8+y}{6}\right)^2 + \left(\frac{-7+z}{8}\right)^2 = 1$$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) 154416. 2) −64339.8 3) 122246. 4) −225190.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 57

Exercise 1

Consider the vectorial field $F(x, y, z) = ($

$$2 x y^2 - \frac{2 y z^2}{x y z + 1} - 2 y^2,\ 2 x^2 y - \frac{2 x z^2}{x y z + 1} - 4 x y,\ -\frac{2 x y z}{x y z + 1} - 2 \log(x y z + 1)$$

). Compute the potential function for this field whose potential at the origin is 3 .

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) −3.16716 2) −2.36716 3) 2.63284 4) −3.56716

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,2\pi] ----\to R^2$

$$r(t) = \left\{ \frac{\left(\frac{\sqrt{3}-1}{2\sqrt{2}} - \frac{(1+\sqrt{3})\sin(t)}{2\sqrt{2}}\right)\cos(t)\,(7\cos(t)+8)}{\sin^2(t)+1},\ \frac{\left(\frac{(\sqrt{3}-1)\sin(t)}{2\sqrt{2}} + \frac{1+\sqrt{3}}{2\sqrt{2}}\right)\cos(t)\,(7\cos(t)+8)}{\sin^2(t)+1} \right\}$$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 148.462 2) 201.462 3) 31.862 4) 106.062

Exercise 3

Consider the vector field $F(x,y,z) =$
$\{-4 x + 5 z + \mathrm{Sin}[2 y^2 - z^2],\ -9 + \mathrm{Sin}[x^2 - 2 z^2],\ -5 x y z + \mathrm{Cos}[x^2 + y^2]\}$ and the surface

$$S \equiv \left(\frac{x}{5}\right)^2 + \left(\frac{-3 + y}{7}\right)^2 + \left(\frac{-4 + z}{6}\right)^2 = 1$$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) −3518.58 2) 6686.52 3) 7390.32 4) 5278.92

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 58

Exercise 1

Consider the vectorial field $F(x, y, z) = ($
$6 x y + z e^{y z}, 3 x^2 + z (x z + 2) e^{y z} + 1, x e^{y z} + y (x z + 2) e^{y z}$
$)$. Compute the potential function for this field whose potential at the origin is 1 .

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) -3.00505 2) 2.99495 3) 3.99495 4) -1.60505

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, \pi] \longrightarrow R^2$
$r(t) = \{(6 t + 7) \sin(2 t) (4 \cos(4 t) + 4), (7 t + 7) \sin(t)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 326.416 2) 977.416 3) 760.416 4) 1085.92

Exercise 3

Consider the vector field $F(x,y,z) = \{-7 x y^2 z^2, -8 x y, 7 y^2 z + 3 z^2\}$ and the surface

$$S \equiv \left(\frac{4 + x}{9}\right)^2 + \left(\frac{-4 + y}{9}\right)^2 + \left(\frac{-6 + z}{7}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) -2.30674×10^7 2) 2.99876×10^7 3) -3.46011×10^7 4) 4.61348×10^7

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 59

Exercise 1

Consider the vectorial field $F(x, y, z) = (-3 y \cos(x y) - y^2 - 2, -2 x y - 3 x \cos(x y), 0)$. Compute the potential function for this field whose potential at the origin is 0.

. Calculate the value of the potential at the point $p = (-10, -8, -6)$.

1) $-\frac{7623}{5} - 3 \text{Sin}[80]$ 2) $660 - 3 \text{Sin}[80]$ 3) $2646 - 3 \text{Sin}[80]$ 4) $-\frac{6299}{5} - 3 \text{Sin}[80]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] \longrightarrow R^2$
$r(t) = \{(8 t + 1) \sin(2 t) (9 \cos(16 t) + 10), (9 t + 9) \sin(t)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 4349.97 2) 870.771 3) 4784.87 4) 1740.57

Exercise 3

Consider the vector field $F(x,y,z) = \{2 x z + 8 y z^2, 8 x y^2 - 7 y^2 z^2, 2 y\}$ and the surface

$S \equiv \left(\frac{2 + x}{3}\right)^2 + \left(\frac{8 + y}{7}\right)^2 + \left(\frac{-9 + z}{8}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) -1.74473×10^7 2) 3.03431×10^7 3) -1.4413×10^7 4) 7.58579×10^6

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 60

Exercise 1

Consider the vectorial field $F(x,y,z) = \left(6xy^2 - 2\log(yz+1),\ 6x^2y - \frac{2xz}{yz+1},\ -\frac{2xy}{yz+1}\right)$. Compute the potential function for this field whose potential at the origin is -6.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) -22.0754 2) -5.87543 3) -7.07543 4) -14.8754

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,2\pi] \dashrightarrow R^2$

$$r(t) = \left\{ \frac{\left(-\frac{(\sqrt{3}-1)\sin(t)}{2\sqrt{2}} - \frac{1+\sqrt{3}}{2\sqrt{2}}\right)\cos(t)\,(7\cos(t)+7)}{\sin^2(t)+1},\ \frac{\left(\frac{\sqrt{3}-1}{2\sqrt{2}} - \frac{(1+\sqrt{3})\sin(t)}{2\sqrt{2}}\right)\cos(t)\,(7\cos(t)+7)}{\sin^2(t)+1} \right\}$$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 18.262 2) 91.062 3) 100.162 4) 145.662

Exercise 3

Consider the vector field $F(x,y,z) =$
$\left\{7 + 5xyz + \mathrm{Cos}\left[y^2\right],\ -6yz + \mathrm{Cos}\left[x^2 + 2z^2\right],\ e^{x^2+y^2} + 6xyz\right\}$ and the surface

$$S \equiv \left(\frac{3+x}{5}\right)^2 + \left(\frac{4+y}{2}\right)^2 + \left(\frac{-9+z}{9}\right)^2 = 1$$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) -61072.6 2) -73287.2 3) $-225970.$ 4) $-152682.$

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 61

Exercise 1

Consider the vectorial field $F(x,y,z)=($ $-z\,(2z+1)\sin(xz)\,,\,2-6y\,,\,2\cos(xz)-x\,(2z+1)\sin(xz)$ $)$. Compute the potential function for this field whose potential at the origin is -4.

. Calculate the value of the potential at the point $p=(-5,8,0)$.

1) -612 2) -180 3) -378 4) -432

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi]\longrightarrow R^2$
$r(t)=\{(9t+4)\sin(2t)\,(5\cos(19t)+5),\,(9t+1)\sin(t)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 1790.38 2) 398.078 3) 2784.88 4) 1989.28

Exercise 3

Consider the vector field $F(x,y,z)=\{-9xy^2z^2,\,8xy^2z+9y^2z^2,\,9xz+y^2z^2\}$ and the surface

$S\equiv\left(\frac{1+x}{3}\right)^2+\left(\frac{-5+y}{8}\right)^2+\left(\frac{9+z}{3}\right)^2=1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) -1.49301×10^7 2) -1.30638×10^7 3) -2.1151×10^7 4) -6.22087×10^6

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 62

Exercise 1

Consider the vectorial field $F(x, y, z) = (3y^2, 6xy + y^2 z^2 + 2(y-2) y z^2, 2(y-2) y^2 z)$. Compute the potential function for this field whose potential at the origin is 1.

. Calculate the value of the potential at the point $p = (-2, 6, 8)$.

1) $\frac{117013}{5}$ 2) $\frac{126014}{5}$ 3) $-\frac{99011}{10}$ 4) 9001

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, \pi] \longrightarrow R^2$
$r(t) = \{(t+9)\sin(2t)(2\cos(10t)+9), (7t+9)\sin(t)(2\cos(10t)+9)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 42466. 2) 23592.4 3) 21233.2 4) 35388.4

Exercise 3

Consider the vector field $F(x,y,z) = \{8y - 5xy^2 z, -xy^2, -yz - 2yz^2\}$ and the surface

$S \equiv \left(\frac{-7+x}{9}\right)^2 + \left(\frac{-3+y}{2}\right)^2 + \left(\frac{3+z}{8}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) −91562.3 2) 233070. 3) 83239.6 4) 216422.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 63

Exercise 1

Consider the vectorial field $F(x,y,z) = \left(\frac{y(z-2)}{xy+1} - 1,\ \frac{x(z-2)}{xy+1} + 6y,\ \log(xy+1)\right)$. Compute the potential function for this field whose potential at the origin is 4 .

. Calculate the value of the potential at the point $p = (-9, -4, 3)$.

1) $61 + \text{Log}[37]$ 2) $-67 + \text{Log}[37]$ 3) $-\frac{719}{5} + \text{Log}[37]$ 4) $-131 + \text{Log}[37]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, \pi] \dashrightarrow R^2$
$r(t) = \{(2t+4)\sin(2t)(4\cos(4t)+6),\ (3t+3)\sin(t)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 453.722 2) 383.922 3) 174.522 4) 349.022

Exercise 3

Consider the vector field $F(x,y,z) = \{-x^2 y^2 z - 9x^2 z^2,\ 4x^2 y z^2,\ 8z^2 + 5xz^2\}$ and the surface

$S \equiv \left(\frac{8+x}{2}\right)^2 + \left(\frac{2+y}{2}\right)^2 + \left(\frac{-8+z}{3}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) -2.945×10^6 2) -1.33863×10^6 3) 1.33864×10^6 4) -2.67727×10^6

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 64

Exercise 1

Consider the vectorial field $F(x,y,z) = (x^3 y^4 z^3 + 3 x^2 y^3 z^3 (x y + 3 y) + 2 x y^2 - 2 y$ $, x^3 (x + 3) y^3 z^3 + 3 x^3 y^2 z^3 (x y + 3 y) + 2 x^2 y - 2 x , 3 x^3 y^3 z^2 (x y + 3 y)$ $)$. Compute the potential function for this field whose potential at the origin is 1 .

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 0.0586111 2) 3.65861 3) 3.75861 4) 0.658611

Exercise 2

Compute the area of the domain whose boundary is the curve

$r : [0,\pi] \longrightarrow R^2$

$r(t) = \left\{\sin(2t)\,(3\cos(t) + 7)\left(\frac{\cos(t)}{\sqrt{2}} - \frac{\sin(t)}{\sqrt{2}}\right), \sin(2t)\,(3\cos(t) + 7)\left(\frac{\sin(t)}{\sqrt{2}} + \frac{\cos(t)}{\sqrt{2}}\right)\right\}$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 42.0188 2) 25.2188 3) 46.2188 4) 33.6188

Exercise 3

Consider the vector field $F(x,y,z) =$ $\{-9 x y - \text{Sin}[2 y^2], -x y + \text{Cos}[2 x^2], -2 x - 2 x y + \text{Cos}[x^2 + y^2]\}$ and the surface

$S \equiv \left(\frac{-9 + x}{4}\right)^2 + \left(\frac{y}{7}\right)^2 + \left(\frac{-9 + z}{2}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) -8447.15 2) -2111.15 3) -8658.35 4) -843.95

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 65

Exercise 1

Consider the vectorial field $F(x,y,z) = ($
$2xyz\,e^{xyz} + 2\,e^{xyz} - 2xy + 2y^2,\ 2x^2 z\,e^{xyz} - x^2 + 4xy,\ 2x^2 y\,e^{xyz}$
$)$. Compute the potential function for this field whose potential at the origin is 0.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 3.86591 2) −0.834093 3) 1.36591 4) 2.16591

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,2\pi] \dashrightarrow R^2$

$$r(t) = \left\{ \frac{\left(-\frac{\sin(t)}{2} - \frac{\sqrt{3}}{2}\right)\cos(t)\,(5\cos(t)+8)}{\sin^2(t)+1},\ \frac{\left(\frac{1}{2} - \frac{1}{2}\sqrt{3}\sin(t)\right)\cos(t)\,(5\cos(t)+8)}{\sin^2(t)+1} \right\}$$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 25.9602 2) 42.9602 3) 110.96 4) 85.4602

Exercise 3

Consider the vector field $F(x,y,z) =$
$\left\{6xy + 4xz + \mathrm{Sin}\left[y^2 + z^2\right],\ 3xy - 8xyz + \mathrm{Cos}\left[2x^2 - 2z^2\right],\ e^{-2x^2+2y^2} + 4xyz\right\}$ and the surface

$$S \equiv \left(\frac{5+x}{7}\right)^2 + \left(\frac{-5+y}{7}\right)^2 + \left(\frac{z}{6}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) −366 373. 2) −188 420. 3) −104 678. 4) 125 614.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 66

Exercise 1

Consider the vectorial field $F(x,y,z) = ((3yz-1)\,e^{xyz} + yz\,e^{xyz}(3xyz-x) - 6x + y,\ 3xz\,e^{xyz} + xz\,e^{xyz}(3xyz-x) + x,\ 3xy\,e^{xyz} + xy\,e^{xyz}(3xyz-x))$. Compute the potential function for this field whose potential at the origin is -1.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 1.16459 2) -8.83541 3) -2.03541 4) -1.83541

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,2\pi] \longrightarrow R^2$

$r(t) = \left\{-\frac{\sin(t)\cos(t)(8\cos(t)+9)}{\sin^2(t)+1},\ \frac{\cos(t)(8\cos(t)+9)}{\sin^2(t)+1}\right\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 257.438 2) 54.9381 3) 81.9381 4) 135.938

Exercise 3

Consider the vector field $F(x,y,z) = \left\{e^{-2y^2+z^2} + 2x - z,\ xy + \mathrm{Cos}[x^2+z^2],\ -8yz + \mathrm{Cos}[2x^2-2y^2]\right\}$ and the surface

$$S \equiv \left(\frac{2+x}{7}\right)^2 + \left(\frac{-2+y}{3}\right)^2 + \left(\frac{2+z}{9}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) -13 933.6 2) -57 001.4 3) -12 666.9 4) 6333.6

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 67

Exercise 1

Consider the vectorial field $F(x,y,z)=($ $y\, e^{x y z}+y z\, e^{x y z}(x y-3 z)-2,\, x\, e^{x y z}+x z\, e^{x y z}(x y-3 z),\, x y\, e^{x y z}(x y-3 z)-3\, e^{x y z}$ $)$. Compute the potential function for this field whose potential at the origin is 2.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 3.51904 2) 0.819041 3) 0.0190412 4) -0.480959

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi]\text{----}\to R^2$
$r(t)=\{(2t+6)\sin(2t)(2\cos(5t)+9),\ (8t+4)\sin(t)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 1940.9 2) 2716.9 3) 1746.9 4) 2910.9

Exercise 3

Consider the vector field $F(x,y,z)=\{-2xz+3x^2yz,\ 6z^2,\ -8yz^2+8y^2z^2\}$ and the surface

$S\equiv\left(\frac{-5+x}{8}\right)^2+\left(\frac{6+y}{4}\right)^2+\left(\frac{-5+z}{9}\right)^2=1$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) -9.79332×10^6 2) $-979332.$ 3) 1.63222×10^6 4) 3.26444×10^6

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 68

Exercise 1

Consider the vectorial field $F(x,y,z) = (-2xy^2 z e^{xy} - 2yz e^{xy} + 4x, -2x^2 y z e^{xy} - 2xz e^{xy} - 3, -2xy e^{xy})$. Compute the potential function for this field whose potential at the origin is -3.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 13.2663   2) −11.7337   3) −15.2337   4) −4.23371

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] \longrightarrow R^2$

$r(t) = \{\sin(2t)\,(8\cos(t)+9)\left(-\frac{(\sqrt{3}-1)\sin(t)}{2\sqrt{2}} - \frac{(1+\sqrt{3})\cos(t)}{2\sqrt{2}}\right), \sin(2t)\,(8\cos(t)+9)\left(\frac{(\sqrt{3}-1)\cos(t)}{2\sqrt{2}} - \frac{(1+}{}\right.$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 88.75   2) 18.35   3) 53.55   4) 106.35

Exercise 3

Consider the vector field $F(x,y,z) = \{-7x + \text{Cos}[z^2], y - \text{Sin}[2x^2 - 2z^2], 8xy + \text{Cos}[x^2 + 2y^2]\}$ and the surface

$$S \equiv \left(\frac{-3+x}{8}\right)^2 + \left(\frac{y}{1}\right)^2 + \left(\frac{9+z}{5}\right)^2 = 1$$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) −2514.31   2) −1005.31   3) −3218.51   4) 2515.69

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 69

Exercise 1

Consider the vectorial field $F(x,y,z) = \left(\frac{z\,(1-3\,x\,y\,z)}{x\,z+1} - 3\,y\,z\log(x\,z+1)\right.$ $, -3\,x\,z\log(x\,z+1) - 3\,,\ \frac{x\,(1-3\,x\,y\,z)}{x\,z+1} - 3\,x\,y\log(x\,z+1)$ $\left.\right)$. Compute the potential function for this field whose potential at the origin is 1 .

. Calculate the value of the potential at the point $p = (9,6,9)$.

1) $-17 - 1457\,\mathrm{Log}[82]$ 2) $6421 - 1457\,\mathrm{Log}[82]$ 3) $\frac{22\,448}{5} - 1457\,\mathrm{Log}[82]$ 4) $\frac{9572}{5} - 1457\,\mathrm{Log}[82]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] \dashrightarrow R^2$

$r(t) = \left\{\sin(2\,t)\,(9\cos(t)+9)\left(\frac{1}{2}\sqrt{3}\cos(t) - \frac{\sin(t)}{2}\right),\ \sin(2\,t)\,(9\cos(t)+9)\left(\frac{1}{2}\sqrt{3}\sin(t) + \frac{\cos(t)}{2}\right)\right\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 76.4259 2) 180.926 3) 114.426 4) 95.4259

Exercise 3

Consider the vector field $F(x,y,z) =$ $\left\{e^{-y^2-z^2} + 2\,y\,z,\ e^{x^2+z^2} - 7\,z + 5\,x\,y\,z,\ 6 - 4\,y\,z + \mathrm{Cos}[x^2 - y^2]\right\}$ and the surface

$S \equiv \left(\frac{7+x}{7}\right)^2 + \left(\frac{-6+y}{3}\right)^2 + \left(\frac{-1+z}{9}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) $-46\,709.2$ 2) 0.800426 3) $-32\,696.2$ 4) $-14\,012.2$

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 70

Exercise 1

Consider the vectorial field $F(x,y,z) = ($
$-z\,(2-2\,x\,z)\,\sin(x\,z) - 2\,z\cos(x\,z) + 4\,y^2\,,\,8\,x\,y\,,\,-x\,(2-2\,x\,z)\,\sin(x\,z) - 2\,x\cos(x\,z)$
$)$. Compute the potential function for this field whose potential at the origin is -2.

. Calculate the value of the potential at the point $p=(-5,3,3)$.

1) $-\frac{5811}{10} + 32\,\mathrm{Cos}[15]$ 2) $-184 + 32\,\mathrm{Cos}[15]$ 3) $\frac{3803}{10} + 32\,\mathrm{Cos}[15]$ 4) $-\frac{8319}{10} + 32\,\mathrm{Cos}[15]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,2\pi] \dashrightarrow R^2$

$r(t) = \left\{-\frac{\sin(t)\,\cos(t)\,(9\cos(t)+9)}{\sin^2(t)+1}\,,\,\frac{\cos(t)\,(9\cos(t)+9)}{\sin^2(t)+1}\right\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 270.531 2) 150.531 3) 285.531 4) 60.531

Exercise 3

Consider the vector field $F(x,y,z) =$
$\{x - 5\,y - \mathrm{Sin}[2\,y^2 + 2\,z^2],\ -5\,y - 7\,y\,z + \mathrm{Cos}[x^2 + 2\,z^2],\ 8 - 6\,x\,y + \mathrm{Cos}[2\,x^2 + 2\,y^2]\}$ and the surface

$S \equiv \left(\frac{1+x}{3}\right)^2 + \left(\frac{3+y}{8}\right)^2 + \left(\frac{-7+z}{8}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) $-42\,625.1$ 2) $72\,465.1$ 3) $-174\,766.$ 4) $-123\,615.$

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 71

Exercise 1

Consider the vectorial field $F(x,y,z)=($

$$-6xy^2+\frac{y(2xz-z)}{xy+1}+2z\log(xy+1),\ \frac{x(2xz-z)}{xy+1}-6x^2y,\ (2x-1)\log(xy+1)$$

). Compute the potential function for this field whose potential at the origin is 5 .

. Calculate the value of the potential at the point $p=(7,0,0)$.

1) -6 2) $\frac{29}{2}$ 3) $\frac{35}{2}$ 4) 5

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,2\pi]$ ----→ R^2

$$r(t)=\left\{\frac{\left(\frac{\sqrt{3}}{2}-\frac{\sin(t)}{2}\right)\cos(t)\,(3\cos(t)+6)}{\sin^2(t)+1},\ \frac{\left(\frac{1}{2}\sqrt{3}\sin(t)+\frac{1}{2}\right)\cos(t)\,(3\cos(t)+6)}{\sin^2(t)+1}\right\}$$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 82.4257 2) 13.6257 3) 43.7257 4) 56.6257

Exercise 3

Consider the vector field $F(x,y,z)=$
$\{\text{Cos}[y^2-2z^2],\ e^{-x^2}+4x-3xy,\ -4y+5xyz-\text{Sin}[x^2-y^2]\}$ and the surface

$$S\equiv\left(\frac{x}{1}\right)^2+\left(\frac{4+y}{6}\right)^2+\left(\frac{1+z}{9}\right)^2=1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 2.5 2) -2.2 3) 0. 4) 1.9

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 72

Exercise 1

Consider the vectorial field $F(x,y,z)=((-3yz-3y)e^{xyz}+yze^{xyz}(-3xyz-3xy)-2x, (-3xz-3x)e^{xyz}+xze^{xyz}(-3xyz-3xy), xye^{xyz}(-3xyz-3xy)-3xye^{xyz})$. Compute the potential function for this field whose potential at the origin is 4 .

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 3.99875 2) 3.59875 3) 2.19875 4) 9.59875

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi] \longrightarrow R^2$

$r(t)=\{\sin(2t)\,(8\cos(t)+8)\left(-\frac{(1+\sqrt{3})\sin(t)}{2\sqrt{2}}-\frac{(\sqrt{3}-1)\cos(t)}{2\sqrt{2}}\right), \sin(2t)\,(8\cos(t)+8)\left(\frac{(1+\sqrt{3})\cos(t)}{2\sqrt{2}}-\frac{(\sqrt{3}\right.$

Indication: it is necessary to represent
 the curve to check whether it has intersection points.

1) 75.3982 2) 60.3982 3) 120.398 4) 112.898

Exercise 3

Consider the vector field $F(x,y,z)=$
$\{e^{-2y^2+2z^2}-7xz, -4x-xy+\text{Sin}[x^2], 2x-\text{Sin}[2x^2+y^2]\}$ and the surface

$S\equiv\left(\frac{6+x}{3}\right)^2+\left(\frac{-7+y}{1}\right)^2+\left(\frac{8+z}{9}\right)^2=1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 11920.4 2) 13322.8 3) 32956.4 4) 7012.03

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 73

Exercise 1

Consider the vectorial field $F(x,y,z) = (-x^2 y^3 z^2 + 2 x y^2 z^2 (-x y - 3 y) + 4$
$, (-x - 3) x^2 y^2 z^2 + 2 x^2 y z^2 (-x y - 3 y) , 2 x^2 y^2 z (-x y - 3 y)$
$)$. Compute the potential function for this field whose potential at the origin is 2 .

. Calculate the value of the potential at the point $p = (0, -8, 1)$.

1) $\frac{24}{5}$ 2) 2 3) $\frac{48}{5}$ 4) $-\frac{27}{5}$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] ----\to R^2$

$r(t) = \left\{ \sin(2t)\,(3\cos(t) + 5) \left(\frac{(1+\sqrt{3})\cos(t)}{2\sqrt{2}} - \frac{(\sqrt{3}-1)\sin(t)}{2\sqrt{2}} \right), \sin(2t)\,(3\cos(t) + 5) \left(\frac{(1+\sqrt{3})\sin(t)}{2\sqrt{2}} + \frac{(\sqrt{3}-}{2} \right.\right.$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 2.46925 2) 18.5692 3) 23.1692 4) 25.4692

Exercise 3

Consider the vector field $F(x,y,z) =$
$\left\{ e^{2 y^2 + z^2} - 8 y, -8 x y + \mathrm{Sin}[2 x^2], 5 x z + \mathrm{Cos}[x^2 + 2 y^2] \right\}$ and the surface

$S \equiv \left(\frac{-9 + x}{4}\right)^2 + \left(\frac{1 + y}{2}\right)^2 + \left(\frac{-2 + z}{2}\right)^2 = 1$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) 4887.44 2) -4343.56 3) -1809.56 4) -8687.56

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 74

Exercise 1

Consider the vectorial field $F(x, y, z) = (-2xy^2 - 2, -2x^2 y, 0)$. Compute the potential function for this field whose potential at the origin is 3.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 5.28889 2) 3.58889 3) 0.788889 4) 1.88889

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, 2\pi] \longrightarrow R^2$

$$r(t) = \left\{ \frac{\left(\frac{1}{\sqrt{2}} - \frac{\sin(t)}{\sqrt{2}}\right) \cos(t)\, (5\cos(t) + 5)}{\sin^2(t) + 1}, \frac{\left(\frac{\sin(t)}{\sqrt{2}} + \frac{1}{\sqrt{2}}\right) \cos(t)\, (5\cos(t) + 5)}{\sin^2(t) + 1} \right\}$$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 46.4602 2) 60.2602 3) 78.6602 4) 37.2602

Exercise 3

Consider the vector field $F(x,y,z) =$
$\left\{e^{2z^2} + 6xyz, 3xz + 3xyz + \mathrm{Cos}[2z^2], -y - 5xz + \mathrm{Cos}[2x^2 - y^2]\right\}$ and the surface

$$S \equiv \left(\frac{5+x}{2}\right)^2 + \left(\frac{6+y}{4}\right)^2 + \left(\frac{2+z}{9}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 38302.3 2) 103416. 3) 168529. 4) -3829.9

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 75

Exercise 1

Consider the vectorial field $F(x, y, z) = ($
$3xy^2\cos(xy) + 3y\sin(xy)$, $3x^2y\cos(xy) + 3x\sin(xy) + 2y$, 0
). Compute the potential function for this field whose potential at the origin is -1.
. Calculate the value of the potential at the point $p = (-1, 5, 3)$.

1) $24 + 15\,\mathrm{Sin}[5]$ 2) $\frac{192}{5} + 15\,\mathrm{Sin}[5]$ 3) $\frac{111}{5} + 15\,\mathrm{Sin}[5]$ 4) $\frac{141}{10} + 15\,\mathrm{Sin}[5]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, \pi] \longrightarrow R^2$

$r(t) = \left\{\sin(2t)\,(2\cos(t) + 10)\left(-\frac{\sin(t)}{\sqrt{2}} - \frac{\cos(t)}{\sqrt{2}}\right),\ \sin(2t)\,(2\cos(t) + 10)\left(\frac{\cos(t)}{\sqrt{2}} - \frac{\sin(t)}{\sqrt{2}}\right)\right\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 136.111   2) 96.1106   3) 80.1106   4) 64.1106

Exercise 3

Consider the vector field $F(x,y,z) =$
$\left\{5yz - 7xyz + \mathrm{Cos}\left[y^2 + 2z^2\right],\ e^{-2x^2 - z^2} - 2y + 3z,\ e^{x^2 - 2y^2} - 9yz\right\}$ and the surface

$S \equiv \left(\frac{-8 + x}{3}\right)^2 + \left(\frac{-9 + y}{5}\right)^2 + \left(\frac{5 + z}{5}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 189499.   2) −7287.45   3) 72884.9   4) 58308.1

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 76

Exercise 1

Consider the vectorial field $F(x, y, z) = (-3xyz^2 \sin(xyz) + 3z\cos(xyz) + 2xy - 6x, x^2 - 3x^2z^2\sin(xyz), 3x\cos(xyz) - 3x^2yz\sin(xyz))$. Compute the potential function for this field whose potential at the origin is -1.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) -7.1139   2) 4.6861   3) -1.1139   4) -1.3139

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, 2\pi] \longrightarrow R^2$

$$r(t) = \left\{ \frac{\left(\frac{1}{\sqrt{2}} - \frac{\sin(t)}{\sqrt{2}}\right)\cos(t)\,(4\cos(t)+8)}{\sin^2(t)+1}, \frac{\left(\frac{\sin(t)}{\sqrt{2}} + \frac{1}{\sqrt{2}}\right)\cos(t)\,(4\cos(t)+8)}{\sin^2(t)+1} \right\}$$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 147.035   2) 139.335   3) 100.835   4) 77.7345

Exercise 3

Consider the vector field $F(x,y,z) = \left\{e^{y^2+2z^2} - 7z - 6xz, -7y - 6yz + \mathrm{Cos}\left[2x^2 - z^2\right], e^{-x^2} - 2x - 3xz\right\}$ and the surface

$$S \equiv \left(\frac{-5+x}{9}\right)^2 + \left(\frac{6+y}{9}\right)^2 + \left(\frac{6+z}{4}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 271432.   2) 74644.2   3) -128930.   4) 67858.4

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 77

Exercise 1

Consider the vectorial field $F(x,y,z)=\left(\frac{yz\,(3xyz-z)}{xyz+1}+3yz\log(xyz+1)-3y^2\right.$ $,\ \frac{xz\,(3xyz-z)}{xyz+1}+3xz\log(xyz+1)-6xy,\ \frac{xy\,(3xyz-z)}{xyz+1}+(3xy-1)\log(xyz+1)$ $\left.\right)$. Compute the potential function for this field whose potential at the origin is 0.

. Calculate the value of the potential at the point $p=(0,5,5)$.

1) 2 2) $-\frac{19}{5}$ 3) 0 4) $\frac{37}{10}$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi]\longrightarrow R^2$

$r(t)=\{(6t+9)\sin(2t)\,(7\cos(12t)+7),\ (8t+7)\sin(t)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 2364.42 2) 4728.32 3) 3377.52 4) 5066.02

Exercise 3

Consider the vector field $F(x,y,z)=\{5x^2y^2z^2,\ 0,\ -8y^2+8xyz^2\}$ and the surface

$S\equiv\left(\frac{-6+x}{7}\right)^2+\left(\frac{-2+y}{2}\right)^2+\left(\frac{-1+z}{9}\right)^2=1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 2.59852×10^6 2) 1.22131×10^7 3) -7.27587×10^6 4) 7.79557×10^6

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 78

Exercise 1

Consider the vectorial field $F(x,y,z)=\left(\frac{y^2 z}{x y z+1}, \frac{x y z}{x y z+1}+\log(x y z+1), \frac{x y^2}{x y z+1}\right)$. Compute the potential function for this field whose potential at the origin is -4.

. Calculate the value of the potential at the point $p=(-9,-4,3)$.

1) $-\frac{247}{10}-4\,\text{Log}[109]$ 2) $-\frac{457}{5}-4\,\text{Log}[109]$ 3) $-\frac{411}{5}-4\,\text{Log}[109]$ 4) $-4-4\,\text{Log}[109]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi]\dashrightarrow R^2$
$r(t)=\{(3t+6)\sin(2t)(8\cos(17t)+8), (7t+6)\sin(t)(8\cos(17t)+8)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 35 938.9 2) 9584.03 3) 31 147.1 4) 23 959.4

Exercise 3

Consider the vector field $F(x,y,z)=\{-2x^2, 3x^2 z, -4x^2 y^2 z+4 y z^2\}$ and the surface

$S\equiv\left(\frac{-9+x}{4}\right)^2+\left(\frac{-9+y}{7}\right)^2+\left(\frac{-5+z}{7}\right)^2=1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) -1.09173×10^8 2) -1.19098×10^8 3) -2.4812×10^7 4) -4.71428×10^7

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 79

Exercise 1

Consider the vectorial field $F(x,y,z) = (2xy^2z^2(2yz+z), 2x^2y^2z^3 + 2x^2yz^2(2yz+z), x^2(2y+1)y^2z^2 + 2x^2y^2z(2yz+z))$. Compute the potential function for this field whose potential at the origin is 0.

. Calculate the value of the potential at the point $p = (9, -2, -9)$.

1) $\frac{11337408}{5}$ 2) $\frac{12754584}{5}$ 3) 708588 4) $-\frac{354294}{5}$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, \pi] \longrightarrow R^2$

$r(t) = \{(3t+5)\sin(2t)(3\cos(14t)+3), (3t+8)\sin(t)(3\cos(14t)+3)\}$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 2489.31 2) 2263.01 3) 3847.11 4) 3394.51

Exercise 3

Consider the vector field $F(x,y,z) = \{-8x^2y^2 - 7xy^2z, 3x - 4yz, -7x^2y^2z\}$ and the surface

$S \equiv (\frac{x}{3})^2 + (\frac{8+y}{1})^2 + (\frac{2+z}{2})^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 8920.89 2) -247.712 3) 2478.09 4) 7929.69

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 80

Exercise 1

Consider the vectorial field $F(x,y,z)=($ $2y^2 z\cos(xyz)+2y^2,\ 2\sin(xyz)+2xyz\cos(xyz)+4xy,\ 2xy^2\cos(xyz)$ $)$. Compute the potential function for this field whose potential at the origin is -2.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) -3.7041 2) 5.4959 3) -1.5041 4) 4.4959

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi]\longrightarrow R^2$
$r(t)=\{(5t+4)\sin(2t)(7\cos(13t)+8),\ (4t+5)\sin(t)(7\cos(13t)+8)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 16 353.2 2) 11 447.3 3) 4906.07 4) 21 259.1

Exercise 3

Consider the vector field $F(x,y,z)=\{6y^2z^2,\ -5x^2yz^2,\ 4xy^2z\}$ and the surface

$$S\equiv\left(\frac{3+x}{4}\right)^2+\left(\frac{-2+y}{8}\right)^2+\left(\frac{3+z}{7}\right)^2=1$$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) -1.22315×10^6 2) -2.56862×10^6 3) 3.05789×10^6 4) 2.44631×10^6

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 81

Exercise 1

Consider the vectorial field $F(x,y,z) = (x^2 y^3 z^2 + 2 x y^2 z^2 (x y + z)$
$, x^3 y^2 z^2 + 2 x^2 y z^2 (x y + z) + 2, x^2 y^2 z^2 + 2 x^2 y^2 z (x y + z)$
). Compute the potential function for this field whose potential at the origin is 0 .

. Calculate the value of the potential at the point $p = (7, -8, -7)$.

1) $-\frac{203\,297\,808}{5}$ 2) $-9\,680\,848$ 3) $-43\,563\,816$ 4) $4\,840\,424$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] \longrightarrow R^2$
$r(t) = \{(3t+8) \sin(2t) (4\cos(17t)+9), (9t+7)\sin(t)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 6306.84 2) 664.535 3) 3319.74 4) 996.435

Exercise 3

Consider the vector field $F(x,y,z) =$
$\{-5x^2 y - 3x^2 y^2, -6x^2 + 4x^2 y^2 z^2, 4y^2 z + 7x^2 y^2 z\}$ and the surface

$S \equiv \left(\frac{-5+x}{9}\right)^2 + \left(\frac{y}{8}\right)^2 + \left(\frac{8+z}{4}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 3.55156×10^6 2) 1.5982×10^7 3) 1.49165×10^7 4) -1.77578×10^6

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 82

Exercise 1

Consider the vectorial field $F(x,y,z) = \left(\frac{3y^2 z}{xyz+1}, \frac{3xyz}{xyz+1} + 3\log(xyz+1) - 6y, \frac{3xy^2}{xyz+1}\right)$. Compute the potential function for this field whose potential at the origin is 2 .

. Calculate the value of the potential at the point $p = (5, -7, -3)$.

1) $-\frac{2912}{5} - 21\,\mathrm{Log}[106]$ 2) $-\frac{2426}{5} - 21\,\mathrm{Log}[106]$

3) $\frac{3892}{5} - 21\,\mathrm{Log}[106]$ 4) $-145 - 21\,\mathrm{Log}[106]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] \longrightarrow R^2$

$r(t) = \{(t+1)\sin(2t)(4\cos(8t)+5), (3t+1)\sin(t)(4\cos(8t)+5)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 340.957 2) 885.757 3) 68.5567 4) 681.457

Exercise 3

Consider the vector field $F(x,y,z) = \{3z^2, -3xy - 9x^2yz, -8y + 9x^2y\}$ and the surface

$S \equiv \left(\frac{-7+x}{8}\right)^2 + \left(\frac{9+y}{9}\right)^2 + \left(\frac{4+z}{2}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) -3.72204×10^6 2) 3.72204×10^6 3) 3.19032×10^6 4) 1.3293×10^6

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 83

Exercise 1

Consider the vectorial field $F(x, y, z) = (x^2 z^2 (y z + 3) + 2 x z^2 (x y z + 3 x) + 4 x y - 2 x , x^3 z^3 + 2 x^2 , x^3 y z^2 + 2 x^2 z (x y z + 3 x))$. Compute the potential function for this field whose potential at the origin is 0 .

. Calculate the value of the potential at the point $p = (5, 1, -1)$.

1) $\frac{55}{2}$ 2) 275 3) $\frac{1815}{2}$ 4) $\frac{2585}{2}$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, 2\pi] \dashrightarrow R^2$

$$r(t) = \left\{ \frac{\left(-\frac{\sin(t)}{\sqrt{2}} - \frac{1}{\sqrt{2}}\right) \cos(t)\,(8\cos(t)+10)}{\sin^2(t)+1}, \frac{\left(\frac{1}{\sqrt{2}} - \frac{\sin(t)}{\sqrt{2}}\right) \cos(t)\,(8\cos(t)+10)}{\sin^2(t)+1} \right\}$$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 154.938 2) 124.138 3) 31.7381 4) 278.138

Exercise 3

Consider the vector field $F(x,y,z) = \{ e^{2 z^2} + y + 8 x z, -6 z - \mathrm{Sin}[2 x^2 + 2 z^2], e^{-x^2+2 y^2} - 4 x y z \}$ and the surface

$$S \equiv \left(\frac{2+x}{4}\right)^2 + \left(\frac{y}{6}\right)^2 + \left(\frac{7+z}{8}\right)^2 = 1$$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) −211 678. 2) −4503.67 3) −45 037.9 4) −148 625.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 84

Exercise 1

Consider the vectorial field $F(x,y,z) = (-y z (x y z - x y) \sin(x y z) + (y z - y) \cos(x y z) - 1,\ -x z (x y z - x y) \sin(x y z) + (x z - x) \cos(x y z) - 6 y,\ x y \cos(x y z) - x y (x y z - x y) \sin(x y z))$. Compute the potential function for this field whose potential at the origin is 0.

. Calculate the value of the potential at the point $p = (8, 7, -6)$.

1) $\frac{3633}{5} - 392 \text{Cos}[336]$ 2) $-\frac{5067}{5} - 392 \text{Cos}[336]$
3) $-\frac{1587}{5} - 392 \text{Cos}[336]$ 4) $-155 - 392 \text{Cos}[336]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] \dashrightarrow R^2$

$r(t) = \left\{\sin(2t)\ (2\cos(t) + 9) \left(\frac{(1+\sqrt{3})\cos(t)}{2\sqrt{2}} - \frac{(\sqrt{3}-1)\sin(t)}{2\sqrt{2}}\right), \sin(2t)\ (2\cos(t) + 9) \left(\frac{(1+\sqrt{3})\sin(t)}{2\sqrt{2}} + \frac{(\sqrt{3}-}{2}\right.\right.$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 32.688 2) 26.188 3) 65.188 4) 110.688

Exercise 3

Consider the vector field $F(x,y,z) =$
$\{-5 z - \text{Sin}[y^2], y z + \text{Sin}[x^2 - 2 z^2], z - 7 x z + \text{Sin}[x^2]\}$ and the surface

$S \equiv \left(\frac{4 + x}{7}\right)^2 + \left(\frac{6 + y}{3}\right)^2 + \left(\frac{8 + z}{4}\right)^2 = 1$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) 2216.73 2) -19 950.3 3) 7389.03 4) 35 467.2

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 85

Exercise 1

Consider the vectorial field $F(x,y,z) = (y z \sin(x y) + y (x y z - 2 z) \cos(x y), x z \sin(x y) + x (x y z - 2 z) \cos(x y) + 6 y, (x y - 2) \sin(x y))$. Compute the potential function for this field whose potential at the origin is -5.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 1.81249 2) −5.68751 3) −4.68751 4) −4.18751

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] \longrightarrow R^2$
$r(t) = \{(7 t + 2) \sin(2 t) (\cos(17 t) + 3), (7 t + 7) \sin(t)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 988.341 2) 1679.94 3) 1482.34 4) 1877.54

Exercise 3

Consider the vector field $F(x,y,z) = \{8 y, -2 y^2 - 6 x y^2 z, 4 x^2 y^2 + 3 x^2 y z^2\}$ and the surface

$S \equiv \left(\frac{-6 + x}{1}\right)^2 + \left(\frac{-2 + y}{3}\right)^2 + \left(\frac{3 + z}{8}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) −88 386.8 2) −114 903. 3) 17 677.6 4) −97 225.5

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 86

Exercise 1

Consider the vectorial field $F(x, y, z) = (-y z (2 x y - y z) \sin(x y z) + 2 y \cos(x y z) + 6 x, (2 x - z) \cos(x y z) - x z (2 x y - y z) \sin(x y z), -x y (2 x y - y z) \sin(x y z) - y \cos(x y z))$. Compute the potential function for this field whose potential at the origin is -4.

. Calculate the value of the potential at the point $p = (-7, -7, -1)$.

1) $-129 + 91 \text{Cos}[49]$ 2) $-163 + 91 \text{Cos}[49]$ 3) $143 + 91 \text{Cos}[49]$ 4) $126 + 91 \text{Cos}[49]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, \pi] \longrightarrow R^2$

$r(t) = \left\{\sin(2t)(4\cos(t) + 9)\left(\frac{\cos(t)}{2} - \frac{1}{2}\sqrt{3}\sin(t)\right), \sin(2t)(4\cos(t) + 9)\left(\frac{\sin(t)}{2} + \frac{1}{2}\sqrt{3}\cos(t)\right)\right\}$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 69.9004 2) 56.1004 3) 90.6004 4) 125.1

Exercise 3

Consider the vector field $F(x,y,z) = \left\{5 x y + 9 x y z + \text{Cos}[2 y^2], 5 + e^{x^2 - z^2}, -5 y + 6 x y z - \text{Sin}[x^2 - y^2]\right\}$ and the surface

$$S \equiv \left(\frac{8 + x}{3}\right)^2 + \left(\frac{8 + y}{4}\right)^2 + \left(\frac{6 + z}{2}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 78 012. 2) −62 409.6 3) −46 807.2 4) 70 210.8

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 87

Exercise 1

Consider the vectorial field $F(x,y,z)=(y\sin(xyz)+yz\,(xy-2yz)\cos(xyz)+3y,\ (x-2z)\sin(xyz)+xz\,(xy-2yz)\cos(xyz)+3x+1,\ xy\,(xy-2yz)\cos(xyz)-2y\sin(xyz))$. Compute the potential function for this field whose potential at the origin is -3.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 1.99608 2) −0.203917 3) −1.80392 4) −5.40392

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi]\longrightarrow R^2$

$r(t)=\left\{\sin(2t)\,(4\cos(t)+8)\left(\frac{1}{2}\sqrt{3}\cos(t)-\frac{\sin(t)}{2}\right),\ \sin(2t)\,(4\cos(t)+8)\left(\frac{1}{2}\sqrt{3}\sin(t)+\frac{\cos(t)}{2}\right)\right\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 50.9487 2) 34.1487 3) 62.1487 4) 56.5487

Exercise 3

Consider the vector field $F(x,y,z)=\{5xy+\mathrm{Cos}[2y^2],\ 6xyz+\mathrm{Cos}[x^2-2z^2],\ -4xz+\mathrm{Sin}[x^2+2y^2]\}$ and the surface

$$S\equiv\left(\frac{-7+x}{4}\right)^2+\left(\frac{-5+y}{2}\right)^2+\left(\frac{7+z}{8}\right)^2=1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 71659.4 2) −15923.7 3) −79620.5 4) −222938.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 88

Exercise 1

Consider the vectorial field $F(x, y, z) = \left(\frac{y z (-x - y)}{x y z + 1} - \log(x y z + 1) - 1, \frac{x z (-x - y)}{x y z + 1} - \log(x y z + 1), \frac{x y (-x - y)}{x y z + 1} \right)$. Compute the potential function for this field whose potential at the origin is 6.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) -7.64493   2) -9.14493   3) 13.8551   4) 5.35507

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, 2\pi] \longrightarrow R^2$

$$r(t) = \left\{ \frac{\left(\frac{\sqrt{3}-1}{2\sqrt{2}} - \frac{(1+\sqrt{3})\sin(t)}{2\sqrt{2}} \right) \cos(t) (3\cos(t)+5)}{\sin^2(t)+1}, \frac{\left(\frac{(\sqrt{3}-1)\sin(t)}{2\sqrt{2}} + \frac{1+\sqrt{3}}{2\sqrt{2}} \right) \cos(t) (3\cos(t)+5)}{\sin^2(t)+1} \right\}$$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 29.5257   2) 16.7257   3) 39.1257   4) 32.7257

Exercise 3

Consider the vector field $F(x,y,z) = \left\{ -4 + e^{y^2+2z^2} - 9 y z, 9 x z - 2 x y z - \mathrm{Sin}\left[2 x^2 + z^2\right], e^{-x^2-y^2} - 6 x z \right\}$ and the surface

$$S \equiv \left(\frac{7 + x}{6}\right)^2 + \left(\frac{y}{6}\right)^2 + \left(\frac{-2 + z}{4}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 42223.   2) -67556.8   3) -80223.7   4) 114002.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 89

Exercise 1

Consider the vectorial field $F(x,y,z)=($ $4xy^2z^2e^{xyz}+4yze^{xyz}+4x,\ 4x^2yz^2e^{xyz}+4xze^{xyz}-2,\ 4x^2y^2ze^{xyz}+4xye^{xyz}$ $)$. Compute the potential function for this field whose potential at the origin is 3.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 12.3523 2) 9.35228 3) 3.35228 4) 13.5523

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi]----\to R^2$

$r(t)=\left\{\sin(2t)\,(4\cos(t)+6)\left(-\frac{(\sqrt{3}-1)\sin(t)}{2\sqrt{2}}-\frac{(1+\sqrt{3})\cos(t)}{2\sqrt{2}}\right),\ \sin(2t)\,(4\cos(t)+6)\left(\frac{(\sqrt{3}-1)\cos(t)}{2\sqrt{2}}-\frac{(1+\right.\right.$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 14.1575 2) 34.5575 3) 65.1575 4) 54.9575

Exercise 3

Consider the vector field $F(x,y,z)=$ $\left\{-8xy+\mathrm{Cos}\left[y^2-2z^2\right],\ 9z-4xyz+\mathrm{Sin}\left[2z^2\right],\ e^{x^2}\right\}$ and the surface

$$S\equiv\left(\frac{-6+x}{8}\right)^2+\left(\frac{-7+y}{2}\right)^2+\left(\frac{8+z}{3}\right)^2=1$$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) 82 032.4 2) 120 314. 3) 27 344.4 4) 109 376.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 90

Exercise 1

Consider the vectorial field $F(x,y,z) = (-6x - 3y^3 z^2 + 3, y^2 z^2 (3z - 3x) + 2yz^2 (3yz - 3xy), 2y^2 z (3yz - 3xy) + 3y^3 z^2)$. Compute the potential function for this field whose potential at the origin is -4.

. Calculate the value of the potential at the point $p = (3, 3, 10)$.

1) 56678 2) $\frac{340068}{5}$ 3) -56678 4) $\frac{255051}{5}$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, \pi] \longrightarrow R^2$

$r(t) = \{(3t + 2) \sin(2t) (4\cos(13t) + 4), (4t + 9) \sin(t) (4\cos(13t) + 4)\}$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 1350.32 2) 3037.82 3) 6075.32 4) 3375.32

Exercise 3

Consider the vector field $F(x,y,z) = \{7yz, -2z^2, 2x\}$ and the surface

$S \equiv \left(\frac{1+x}{4}\right)^2 + \left(\frac{-4+y}{9}\right)^2 + \left(\frac{-3+z}{4}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 0. 2) −0.1 3) 0.2 4) −2.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 91

Exercise 1

Consider the vectorial field $F(x,y,z) = (2y^2 z^2 e^{xyz}, 2xyz^2 e^{xyz} + 2z e^{xyz}, 2xy^2 z e^{xyz} + 2y e^{xyz})$. Compute the potential function for this field whose potential at the origin is 2.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 8.4358 2) 2.6358 3) −3.9642 4) 7.4358

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] \longrightarrow R^2$
$r(t) = \{ (9t+8)\sin(2t)(7\cos(16t)+8), (t+7)\sin(t)(7\cos(16t)+8) \}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 40775.9 2) 2265.76 3) 36245.3 4) 22653.5

Exercise 3

Consider the vector field $F(x,y,z) = \{3x^2yz, -6xy^2z, 8y^2 - 6x^2y^2z\}$ and the surface

$$S \equiv \left(\frac{-9+x}{6}\right)^2 + \left(\frac{6+y}{6}\right)^2 + \left(\frac{3+z}{7}\right)^2 = 1$$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) -2.50642×10^7 2) 5.76476×10^7 3) -8.52182×10^7 4) -9.77503×10^7

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 92

Exercise 1

Consider the vectorial field $F(x,y,z)=(-y z\,(1-3 x y z)\,\sin(x y z)-3 y z\cos(x y z)-1,\ -x z\,(1-3 x y z)\,\sin(x y z)-3 x z\cos(x y z)-6 y,\ -x y\,(1-3 x y z)\,\sin(x y z)-3 x y\cos(x y z))$. Compute the potential function for this field whose potential at the origin is -1.

. Calculate the value of the potential at the point $p=(-7,-9,-2)$.

1) $-238+379\,\mathrm{Cos}[126]$ 2) $-\frac{6069}{10}+379\,\mathrm{Cos}[126]$

3) $-\frac{5117}{10}+379\,\mathrm{Cos}[126]$ 4) $\frac{238}{5}+379\,\mathrm{Cos}[126]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi]---\!\!\to R^2$

$r(t)=\left\{\sin(2t)\,(9\cos(t)+9)\left(\frac{1}{2}\sqrt{3}\cos(t)-\frac{\sin(t)}{2}\right),\ \sin(2t)\,(9\cos(t)+9)\left(\frac{1}{2}\sqrt{3}\sin(t)+\frac{\cos(t)}{2}\right)\right\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 95.4259 2) 180.926 3) 28.9259 4) 133.426

Exercise 3

Consider the vector field $F(x,y,z)=$
$\left\{6xy-2xyz+\mathrm{Cos}\left[y^2-z^2\right],\ 1+e^{-2x^2-2z^2},\ e^{-2y^2}+4xy-5xz\right\}$ and the surface

$S\equiv\left(\frac{7+x}{1}\right)^2+\left(\frac{8+y}{1}\right)^2+\left(\frac{6+z}{4}\right)^2=1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) -1826.31 2) 3837.39 3) 2375.79 4) -6211.11

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 93

Exercise 1

Consider the vectorial field $F(x,y,z)=($ $-2x-2yze^{yz}-y,\ -2xyz^2e^{yz}-2xze^{yz}-x,\ -2xy^2ze^{yz}-2xye^{yz}$ $)$. Compute the potential function for this field whose potential at the origin is 2 .

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) −1.78371   2) 3.61629   3) 1.01629   4) 2.41629

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,2\pi]\longrightarrow R^2$

$$r(t)=\left\{\frac{\left(\frac{1}{\sqrt{2}}-\frac{\sin(t)}{\sqrt{2}}\right)\cos(t)\,(8\cos(t)+9)}{\sin^2(t)+1},\ \frac{\left(\frac{\sin(t)}{\sqrt{2}}+\frac{1}{\sqrt{2}}\right)\cos(t)\,(8\cos(t)+9)}{\sin^2(t)+1}\right\}$$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 162.938   2) 230.438   3) 189.938   4) 135.938

Exercise 3

Consider the vector field $F(x,y,z)=$ $\{6x-\mathrm{Sin}[2y^2],\ 6xyz+\mathrm{Cos}[2x^2-z^2],\ -5y+7yz+\mathrm{Cos}[x^2-y^2]\}$ and the surface

$$S\equiv\left(\frac{2+x}{8}\right)^2+\left(\frac{-6+y}{7}\right)^2+\left(\frac{-3+z}{8}\right)^2=1$$

Compute $\int_S F.$

Indication: Use Gauss' Theorem if it is necessary.

1) 54044.1   2) 22518.9   3) −40531.5   4) 81065.7

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 94

Exercise 1

Consider the vectorial field $F(x, y, z) = (-2 y z^2, -2 x z^2 - 2 y, -4 x y z)$. Compute the potential function for this field whose potential at the origin is 4.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 3.5 2) 1.1 3) 15.5 4) -8.5

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,2\pi] \longrightarrow R^2$

$r(t) = \left\{ \frac{\cos(t)\,(6\cos(t)+9)}{\sin^2(t)+1}, \frac{\sin(t)\cos(t)\,(6\cos(t)+9)}{\sin^2(t)+1} \right\}$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 100.803 2) 111.903 3) 178.503 4) 200.703

Exercise 3

Consider the vector field $F(x,y,z) = \{-5 y - \text{Sin}[2 y^2 - z^2], -3 x + x y z + \text{Cos}[z^2], 8 y z - \text{Sin}[2 y^2]\}$ and the surface

$S \equiv \left(\frac{-4 + x}{4}\right)^2 + \left(\frac{-2 + y}{9}\right)^2 + \left(\frac{-3 + z}{6}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 126 666. 2) 25 333.8 3) -75 998.2 4) 5067.4

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 95

Exercise 1

Consider the vectorial field $F(x,y,z) = \left(\dfrac{y z\,(2x - 2xz)}{x y z + 1} + (2 - 2z)\log(x y z + 1) + 6 x y + 4 x\right.$ $\left., 3x^2 + \dfrac{x z\,(2x - 2xz)}{x y z + 1}, \dfrac{x y\,(2x - 2xz)}{x y z + 1} - 2x\log(x y z + 1)\right)$. Compute the potential function for this field whose potential at the origin is 3.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) 5.81655 2) −4.98345 3) 4.21655 4) 1.01655

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,2\pi] ----\to R^2$

$$r(t) = \left\{ \frac{\left(\frac{\sqrt{3}-1}{2\sqrt{2}} - \frac{(1+\sqrt{3})\sin(t)}{2\sqrt{2}}\right)\cos(t)\,(6\cos(t)+7)}{\sin^2(t)+1}, \frac{\left(\frac{(\sqrt{3}-1)\sin(t)}{2\sqrt{2}} + \frac{1+\sqrt{3}}{2\sqrt{2}}\right)\cos(t)\,(6\cos(t)+7)}{\sin^2(t)+1} \right\}$$

Indication: it is necessary to represent
 the curve to check whether it has intersection points.

1) 87.8027 2) 79.9027 3) 16.7027 4) 40.4027

Exercise 3

Consider the vector field $F(x,y,z) =$
$\left\{9 y z + \text{Sin}\left[y^2 + 2 z^2\right], 3 + e^{-x^2}, -2 y + \text{Cos}\left[x^2 - y^2\right]\right\}$ and the surface

$$S \equiv \left(\frac{4 + x}{4}\right)^2 + \left(\frac{-7 + y}{2}\right)^2 + \left(\frac{3 + z}{8}\right)^2 = 1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) −2.3 2) 0.4 3) 0. 4) −0.8

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 96

Exercise 1

Consider the vectorial field $F(x,y,z)=(2y\,e^{xyz}+y\,z\,e^{xyz}(2xy+z)+4x-2y, 2x\,e^{xyz}+x\,z\,e^{xyz}(2xy+z)-2x, x\,y\,e^{xyz}(2xy+z)+e^{xyz})$. Compute the potential function for this field whose potential at the origin is -1.

. Calculate the integral of the potential function ϕ over the domain $[0,1]^3$.

1) −3.59791 2) 1.10209 3) 0.402091 4) 0.702091

Exercise 2

Compute the area of the domain whose boundary is the curve

$r:[0,\pi]\longrightarrow R^2$

$r(t)=\left\{\sin(2t)\,(2\cos(t)+3)\left(-\frac{(1+\sqrt{3})\sin(t)}{2\sqrt{2}}-\frac{(\sqrt{3}-1)\cos(t)}{2\sqrt{2}}\right), \sin(2t)\,(2\cos(t)+3)\left(\frac{(1+\sqrt{3})\cos(t)}{2\sqrt{2}}-\frac{(\sqrt{3}\right.\right.$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 1.43938 2) 7.83938 3) 8.63938 4) 9.43938

Exercise 3

Consider the vector field $F(x,y,z)=$
$\left\{-6+\mathrm{Sin}[z^2], e^{x^2-z^2}+2xz-6xyz, 7x+\mathrm{Cos}[x^2-y^2]\right\}$ and the surface

$$S\equiv\left(\frac{-8+x}{4}\right)^2+\left(\frac{2+y}{6}\right)^2+\left(\frac{-9+z}{7}\right)^2=1$$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) −395 207. 2) −304 006. 3) 912 018. 4) −516 810.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 97

Exercise 1

Consider the vectorial field $F(x, y, z) = ($
$2 x y^2 + x y z \sin(x y z) - \cos(x y z)$, $x^2 z \sin(x y z) + 2 x^2 y - 6 y$, $x^2 y \sin(x y z)$
). Compute the potential function for this field whose potential at the origin is -3 .

. Calculate the value of the point $p = (-3, -1, -6)$.

1) $\frac{53}{5} + 3\,\mathrm{Cos}[18]$ 2) $-\frac{37}{5} + 3\,\mathrm{Cos}[18]$ 3) $13 + 3\,\mathrm{Cos}[18]$ 4) $3 + 3\,\mathrm{Cos}[18]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, \pi] \dashrightarrow R^2$
$r(t) = \{\sin(2 t)\,(-\cos(t))\,(7 \cos(t) + 9), -(\sin(t) \sin(2 t)\,(7 \cos(t) + 9))\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 82.8595   2) 123.86   3) 66.4595   4) 74.6595

Exercise 3

Consider the vector field $F(x,y,z) =$
$\{9 y z + \mathrm{Cos}[y^2 + z^2], e^{x^2+z^2} - 5 y + 5 x y, e^{-x^2-y^2} - 6 x\}$ and the surface

$S \equiv \left(\frac{-4 + x}{6}\right)^2 + \left(\frac{-3 + y}{5}\right)^2 + \left(\frac{3 + z}{3}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 5654.87   2) -9045.53   3) 16 397.5   4) 19 789.9

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 98

Exercise 1

Consider the vectorial field $F(x, y, z) = (3x^2 y^3 (z+2) + 6x, 3x^3 y^2 (z+2), x^3 y^3)$. Compute the potential function for this field whose potential at the origin is -5.

. Calculate the value of the potential at the point $p = (-3, -3, 4)$.

1) $-\frac{52752}{5}$ 2) $-\frac{24178}{5}$ 3) 4396 4) -10990

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0, \pi] \longrightarrow R^2$
$r(t) = \{(2t+4)\sin(2t)(\cos(4t)+4), (2t+9)\sin(t)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 85.6985 2) 425.698 3) 128.198 4) 808.198

Exercise 3

Consider the vector field $F(x,y,z) = \{8+7y, -3x^2y^2 - xz, -7xy^2 - 7y^2z^2\}$ and the surface

$S \equiv \left(\frac{8+x}{9}\right)^2 + \left(\frac{-6+y}{5}\right)^2 + \left(\frac{-6+z}{6}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 1.7185×10^7 2) 1.7901×10^7 3) -7.16042×10^6 4) 7.87646×10^6

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 99

Exercise 1

Consider the vectorial field $F(x,y,z) = (y z(-3 x y - y)\cos(x y z) - 3 y \sin(x y z), (-3 x - 1)\sin(x y z) + x z(-3 x y - y)\cos(x y z) - 10 y, x y(-3 x y - y)\cos(x y z))$. Compute the potential function for this field whose potential at the origin is -3.

. Calculate the value of the potential at the point $p=(2,-5,8)$.

1) $-\frac{781}{5} - 35\,\text{Sin}[80]$ 2) $-\frac{1768}{5} - 35\,\text{Sin}[80]$ 3) $-\frac{1298}{5} - 35\,\text{Sin}[80]$ 4) $-128 - 35\,\text{Sin}[80]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] \longrightarrow R^2$

$r(t) = \{(7t+5)\sin(2t)(5\cos(6t)+7), (t+3)\sin(t)(5\cos(6t)+7)\}$

Indication: it is necessary to represent the curve to check whether it has intersection points.

1) 6211.99 2) 10559.7 3) 8696.39 4) 4969.79

Exercise 3

Consider the vector field $F(x,y,z) = \{2y, -x y^2 z^2, -6 z^2 - 7 y z^2\}$ and the surface

$S \equiv \left(\frac{1+x}{3}\right)^2 + \left(\frac{6+y}{3}\right)^2 + \left(\frac{8+z}{3}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) −370670. 2) −200780. 3) −154446. 4) −525116.

Further Mathematics - Degree in Engineering - 2024/2025 04-Line and Surface Integral-Computers exam for serial number: 100

Exercise 1

Consider the vectorial field $F(x,y,z) = (-2y^2 - 3, -4xy - z(2yz + 3y)\sin(yz) + (2z+3)\cos(yz), 2y\cos(yz) - y(2yz+3y)\sin(yz))$. Compute the potential function for this field whose potential at the origin is 5.

. Calculate the value of the potential at the point $p = (10, 10, 3)$.

1) $-2025 + 90\,\mathrm{Cos}[30]$ 2) $\frac{29109}{5} + 90\,\mathrm{Cos}[30]$ 3) $\frac{3959}{5} + 90\,\mathrm{Cos}[30]$ 4) $-5043 + 90\,\mathrm{Cos}[30]$

Exercise 2

Compute the area of the domain whose boundary is the curve

$r: [0,\pi] \dashrightarrow R^2$
$r(t) = \{(4t+9)\sin(2t)(4\cos(2t)+7), (6t+2)\sin(t)(4\cos(2t)+7)\}$

Indication: it is necessary to represent
the curve to check whether it has intersection points.

1) 598.829   2) 9579.33   3) 8381.93   4) 5987.13

Exercise 3

Consider the vector field $F(x,y,z) = \{3 - 4xy^2, 0, 8y^2\}$ and the surface

$S \equiv \left(\frac{7+x}{1}\right)^2 + \left(\frac{-8+y}{6}\right)^2 + \left(\frac{3+z}{3}\right)^2 = 1$

Compute $\int_S F$.

Indication: Use Gauss' Theorem if it is necessary.

1) 8590.19   2) 62275.2   3) -53684.4   4) -21473.4