

Further Mathematics - Degree in Engineering - 2025/2026

03-04-Differential Geometry-Line/Surface integral-Handwritten training exam for serial number: 1

Exercise 1

Compute the center of curvature for $C(t) = \{-t^2, t, t^2\}$ at the point $t=3$.

- 1) $\{-48.85, -302.4, -80.75\}$
- 2) $\{167.15, -151.2, 156.85\}$
- 3) $\{-27.25, -216., 27.25\}$
- 4) $\{-178.45, -21.6, 156.85\}$
- 5) $\{-221.65, -259.2, 178.45\}$

Exercise 2

Compute the mean curvature for $X(u,v) = \{\cos[u], \sin[u], v\}$ at the point $(u,v) = (3, 4)$.

- 1) $H(3, 4) = -3.38388$
- 2) $H(3, 4) = -3.66251$
- 3) $H(3, 4) = -5.63935$
- 4) $H(3, 4) = -1.52301$
- 5) $H(3, 4) = 0.5$

Exercise 3

Consider the vectorial field $F(x, y) = \left(\frac{3xy^2}{xy+1} + 3y \log(xy+1) + 3, \frac{3x^2y}{xy+1} + 3x \log(xy+1) + x \right)$.

. 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 $[0,1]^2$.

- 1) -1.7337 2) 15.2663 3) 3.7663 4) -4.2337
- 5) The vector field is not conservative.

Further Mathematics - Degree in Engineering - 2025/2026

03-04-Differential Geometry-Line/Surface integral-Handwritten training exam for serial number: 2

Exercise 1

Compute the center of curvature for $C(t) = \{2t^2, 3-3t, -2t^2\}$ at the point $t=0$.

- 1) $\{-0.075, 5.1, -3.525\}$
- 2) $\{1.425, 3.9, 0.975\}$
- 3) $\{-0.375, 2.4, -3.225\}$
- 4) $\{3.825, 5.4, -2.625\}$
- 5) $\{1.125, 3., -1.125\}$

Exercise 2

Compute the Gauss curvature for $X(u,v) = \{v^2 \cos[u], v^2 \sin[u], v\}$ at the point $(u,v) = (5, 8)$.

- 1) $K(5, 8) = -6.9204$
- 2) $K(5, 8) = -3.92334$
- 3) $K(5, 8) = -1.94379$
- 4) $K(5, 8) = -3.24432$
- 5) $K(5, 8) = -4.73134 \times 10^{-7}$

Exercise 3

Consider the vectorial field $F(x, y) = (3x^3y^3 + 3x^2(3x+3)y^3, 3x^3(3x+3)y^2)$. 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 $[0,1]^2$.

- 1) 4.3375 2) -4.8625 3) 6.3375 4) 8.7375
- 5) The vector field is not conservative.

Further Mathematics - Degree in Engineering - 2025/2026
 03-04-Differential Geometry-Line/Surface integral-Handwritten
 training exam for serial number: 3

Exercise 1

Compute the center of curvature for $C(t) = \{3 - 2t, -3t^2, 3t^2\}$ at the point $t = 2$.

- 1) $\{523.8, 167.367, -50.9667\}$
- 2) $\{465.6, -94.5333, 152.733\}$
- 3) $\{203.7, -269.133, 7.23333\}$
- 4) $\{291., -36.3333, 36.3333\}$
- 5) $\{436.5, -240.033, 298.233\}$

Exercise 2

Compute the mean curvature for $X(u, v) = \{v^2 \cos[u], v^2 \sin[u], v\}$ at the point $(u, v) = (6, 10)$.

- 1) $H(6, 10) = 0.530407$
- 2) $H(6, 10) = 0.000125155$
- 3) $H(6, 10) = -5.00916$
- 4) $H(6, 10) = 4.95815$
- 5) $H(6, 10) = -4.13275$

Exercise 3

Consider the vectorial field $F(x, y) = (4xy e^{xy} + 4e^{xy} - 6x, 4x^2 e^{xy})$.

. Compute the potential function for this field whose potential at the origin is 2.

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

- 1) 63.5421 2) 166.242 3) 16.1421 4) 79.3421
- 5) The vector field is not conservative.

Further Mathematics - Degree in Engineering - 2025/2026

03-04-Differential Geometry-Line/Surface integral-Handwritten training exam for serial number: 4

Exercise 1

Compute the center of curvature for $C(t) = \{-3t^2, -3t^2, -2+t\}$ at the point $t = -1$.

- 1) $\{-16.0833, -37.0833, 133.\}$
- 2) $\{-9.08333, -9.08333, 70.\}$
- 3) $\{46.9167, 25.9167, 133.\}$
- 4) $\{-23.0833, -65.0833, 133.\}$
- 5) $\{4.91667, -30.0833, 56.\}$

Exercise 2

Compute the mean curvature for $X(u,v) = \{\cos[u], \sin[u], v\}$ at the point $(u,v) = (3, 3)$.

- 1) $H(3, 3) = 1.72791$
- 2) $H(3, 3) = 3.45854$
- 3) $H(3, 3) = 0.5$
- 4) $H(3, 3) = 7.58322$
- 5) $H(3, 3) = 2.73395$

Exercise 3

Consider the vectorial field $F(x, y) = (3x^2y^2 + 2x(3x-1)y^2 - 10x, 2x^2(3x-1)y)$. Compute the potential function for this field whose potential at the origin is 0.

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

- 1) -201. 2) -723.6 3) 140.7 4) -623.1
- 5) The vector field is not conservative.

Further Mathematics - Degree in Engineering - 2025/2026

03-04-Differential Geometry-Line/Surface integral-Handwritten training exam for serial number: 5

Exercise 1

Compute the center of curvature for $C(t) = \{2t^2, -2-t, -3t^2\}$ at the point $t = -3$.

- 1) $\{54.0769, -1406., -81.1154\}$
- 2) $\{-1211.32, -140.6, -1205.92\}$
- 3) $\{897.677, -703., 903.085\}$
- 4) $\{-227.123, -2390.2, -362.315\}$
- 5) $\{1038.28, -984.2, -1205.92\}$

Exercise 2

Compute the Gauss curvature for $X(u,v) = \{v \cos[u], v \sin[u], v\}$ at the point $(u,v) = (2, 6)$.

- 1) $K(2, 6) = -0.539621$
- 2) $K(2, 6) = 8.05084$
- 3) $K(2, 6) = 0$
- 4) $K(2, 6) = -8.37007$
- 5) $K(2, 6) = 2.07023$

Exercise 3

Consider the vectorial field $F(x, y) = (6x - (-y - 2)y \sin(xy), -x(-y - 2) \sin(xy) - \cos(xy))$. 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 $[0, 1]^2$.

- 1) -4.35186 2) 2.64814 3) -0.351864 4) 5.84814
- 5) The vector field is not conservative.

Further Mathematics - Degree in Engineering - 2025/2026

03-04-Differential Geometry-Line/Surface integral-Handwritten training exam for serial number: 6

Exercise 1

Compute the center of curvature for $C(t) = \{3t, -t^2, 3t^2\}$ at the point $t=1$.

- 1) $\{-5.53333, -15.15, -1.35\}$
- 2) $\{-13.3333, -3.45, 10.35\}$
- 3) $\{-9.43333, -8.65, 22.05\}$
- 4) $\{-4.23333, 4.35, 7.75\}$
- 5) $\{-2.93333, -2.15, 6.45\}$

Exercise 2

Compute the mean curvature for $X(u,v) = \{v \cos[u], v \sin[u], v\}$ at the point $(u,v) = (6, 9)$.

- 1) $H(6, 9) = -5.30428$
- 2) $H(6, 9) = 0.0392837$
- 3) $H(6, 9) = 3.74556$
- 4) $H(6, 9) = 2.77289$
- 5) $H(6, 9) = 5.56414$

Exercise 3

Consider the vectorial field $F(x, y) = (2e^{xy} + ye^{xy}(2x+y) + 2x, xe^{xy}(2x+y) + e^{xy})$. 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 $[0,1]^2$.

- 1) -0.911821 2) 0.488179 3) -0.811821 4) -3.51182
- 5) The vector field is not conservative.

Further Mathematics - Degree in Engineering - 2025/2026

03-04-Differential Geometry-Line/Surface integral-Handwritten training exam for serial number: 7

Exercise 1

Compute the center of curvature for $C(t) = \{-t^2, 3 + 2t, -3t^2\}$ at the point $t = 3$.

- 1) $\{-188.3, -966.6, 348.\}$
- 2) $\{-242., -859.2, -189.\}$
- 3) $\{80.2, -161.1, -457.5\}$
- 4) $\{-456.8, -375.9, -457.5\}$
- 5) $\{-27.2, -537., -81.6\}$

Exercise 2

Compute the Gauss curvature for $X(u,v) = \{e^v \cos[u], e^v \sin[u], v\}$ at the point $(u,v) = (3, 3)$.

- 1) $K(3, 3) = 0.504598$
- 2) $K(3, 3) = 3.52913$
- 3) $K(3, 3) = 0.74917$
- 4) $K(3, 3) = 5.48906$
- 5) $K(3, 3) = -6.11387 \times 10^{-6}$

Exercise 3

Consider the vectorial field $F(x, y) = (-y(-2xy - 1) \sin(xy) - 2y \cos(xy) + y - 2, -x(-2xy - 1) \sin(xy) - 2x \cos(xy))$. 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 $[0, 1]^2$.

- 1) -8.38585 2) -15.5859 3) -5.38585 4) -1.78585
- 5) The vector field is not conservative.

Further Mathematics - Degree in Engineering - 2025/2026
 03-04-Differential Geometry-Line/Surface integral-Handwritten
 training exam for serial number: 8

Exercise 1

Compute the center of curvature for $C(t) = \{2t^2, -t^2, 1+2t\}$ at the point $t = -1$.

- 1) $\{6.8, -3.4, 11.\}$
- 2) $\{-0.9, -12.2, 2.2\}$
- 3) $\{13.4, -5.6, 6.6\}$
- 4) $\{9., -4.5, 5.5\}$
- 5) $\{13.4, 6.5, 8.8\}$

Exercise 2

Compute the Gauss curvature for $X(u,v) = \{e^u \cos[u], e^u \sin[u], v\}$ at the point $(u,v) = (1,1)$.

- 1) $K(1,1) = -0.0142093$
- 2) $K(1,1) = 3.40988$
- 3) $K(1,1) = -3.4245$
- 4) $K(1,1) = 7.72426$
- 5) $K(1,1) = 4.16983$

Exercise 3

Consider the vectorial field $F(x,y) = (-y(3xy+3)\sin(xy) + 3y\cos(xy) - 4x, 3x\cos(xy) - x(3xy+3)\sin(xy))$. Compute the potential function for this field whose potential at the origin is 10.

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

- 1) 10.1059 2) 36.1059 3) -12.8941 4) 32.1059
- 5) The vector field is not conservative.

Further Mathematics - Degree in Engineering - 2025/2026
 03-04-Differential Geometry-Line/Surface integral-Handwritten
 training exam for serial number: 9

Exercise 1

Compute the center of curvature for $C(t) = \{-3t^2, -1-3t, -3t^2\}$ at the point $t = -3$.

- 1) $\{-341.35, -713.9, 307.65\}$
- 2) $\{-81.75, -649., -81.75\}$
- 3) $\{-536.05, -1168.2, -471.15\}$
- 4) $\{372.55, -1168.2, 437.45\}$
- 5) $\{48.05, -843.7, 437.45\}$

Exercise 2

Compute the Gauss curvature for $X(u,v) = \{\cos[u], \sin[u], v\}$ at the point $(u,v) = (1, 8)$.

- 1) $K(1, 8) = 2.66723$
- 2) $K(1, 8) = -5.38958$
- 3) $K(1, 8) = 8.36877$
- 4) $K(1, 8) = 1.72139$
- 5) $K(1, 8) = 0$

Exercise 3

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

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

- 1) 1.2 2) 4. 3) 2.8 4) 9.2
- 5) The vector field is not conservative.

Further Mathematics - Degree in Engineering - 2025/2026
 03-04-Differential Geometry-Line/Surface integral-Handwritten
 training exam for serial number: 10

Exercise 1

Compute the center of curvature for $C(t) = \{-2t, -t^2, 2t^2\}$ at the point $t=0$.

- 1) $\{0, -0.4, 0.8\}$
- 2) $\{0.5, 0, 1.1\}$
- 3) $\{-0.6, -1., 1.3\}$
- 4) $\{-0.1, -0.6, 0.5\}$
- 5) $\{-0.1, 0.3, 0.1\}$

Exercise 2

Compute the mean curvature for $X(u,v) = \{e^u \cos[u], e^u \sin[u], v\}$ at the point $(u,v) = (3, 10)$.

- 1) $H(3, 10) = -4.83734$
- 2) $H(3, 10) = 4.69168$
- 3) $H(3, 10) = -5.12113$
- 4) $H(3, 10) = -5.13403$
- 5) $H(3, 10) = 0$

Exercise 3

Consider the vectorial field $F(x, y) = (x(3-y)y + y(3x-xy) - 2, x(3x-xy) - x^2y)$. 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 $[0,1]^2$.

- 1) 3.68889 2) 2.48889 3) 2.78889 4) 1.38889
- 5) The vector field is not conservative.

Further Mathematics - Degree in Engineering - 2025/2026
 03-04-Differential Geometry-Line/Surface integral-Handwritten
 training exam for serial number: 11

Exercise 1

Compute the center of curvature for $C(t) = \{2t^2, 3t^2, 2-3t\}$ at the point $t=2$.

- 1) $\{122.692, 135.038, 70.6667\}$
- 2) $\{24.6923, 37.0385, 140.667\}$
- 3) $\{122.692, -4.96154, 196.667\}$
- 4) $\{-17.3077, 107.038, 154.667\}$
- 5) $\{94.6923, -18.9615, 126.667\}$

Exercise 2

Compute the Gauss curvature for $X(u,v) = \{u, 3u^2, v\}$ at the point $(u,v) = (4, 3)$.

- 1) $K(4, 3) = -6.96323$
- 2) $K(4, 3) = 0$
- 3) $K(4, 3) = 7.64167$
- 4) $K(4, 3) = -1.04016$
- 5) $K(4, 3) = -1.19788$

Exercise 3

Consider the vectorial field $F(x, y) = (-y(2x-y)\sin(xy) + 2\cos(xy) + 6x, -x(2x-y)\sin(xy) - \cos(xy))$. 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 $[0,1]^2$.

- 1) 42.7597 2) 4.0597 3) -24.7403 4) 9.4597
- 5) The vector field is not conservative.

Further Mathematics - Degree in Engineering - 2025/2026
 03-04-Differential Geometry-Line/Surface integral-Handwritten
 training exam for serial number: 12

Exercise 1

Compute the center of curvature for $C(t) = \{2t^2, 2t^2, -2t\}$ at the point $t=1$.

- 1) $\{14.5, 4.9, 4.8\}$
- 2) $\{6.5, 6.5, 16.\}$
- 3) $\{-7.9, 12.9, 11.2\}$
- 4) $\{20.9, 8.1, 24.\}$
- 5) $\{8.1, -1.5, 17.6\}$

Exercise 2

Compute the Gauss curvature for $X(u,v) = \{3u, 3, v\}$ at the point $(u,v) = (5, 7)$.

- 1) $K(5, 7) = -2.90826$
- 2) $K(5, 7) = 0$
- 3) $K(5, 7) = 8.89729$
- 4) $K(5, 7) = -3.55261$
- 5) $K(5, 7) = -6.48636$

Exercise 3

Consider the vectorial field $F(x, y) = (ye^{xy} + ye^{xy}(xy + 3y) + 3, (x+3)e^{xy} + xe^{xy}(xy + 3y))$. 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 $[0,1]^2$.

- 1) 4.35523 2) -2.74477 3) 1.05523 4) -1.44477
- 5) The vector field is not conservative.

Further Mathematics - Degree in Engineering - 2025/2026
 03-04-Differential Geometry-Line/Surface integral-Handwritten
 training exam for serial number: 13

Exercise 1

Compute the center of curvature for $C(t) = \{t^2, t^2, -2t\}$ at the point $t=1$.

- 1) $\{4., 4., 4.\}$
- 2) $\{1.2, 6., 4.8\}$
- 3) $\{7.6, 2., 3.6\}$
- 4) $\{1.2, 7.2, 6.4\}$
- 5) $\{0.8, 2.4, 0.4\}$

Exercise 2

Compute the mean curvature for $X(u,v) = \{e^u \cos[u], e^u \sin[u], v\}$ at the point $(u,v) = (4, 7)$.

- 1) $H(4, 7) = -0.588049$
- 2) $H(4, 7) = 3.13808$
- 3) $H(4, 7) = -7.73585$
- 4) $H(4, 7) = 5.78494$
- 5) $H(4, 7) = 0$

Exercise 3

Consider the vectorial field $F(x, y) = \left(-\frac{xy^2}{xy+1} - y \log(xy+1), -\frac{x^2y}{xy+1} - x \log(xy+1) + x \right)$.

. Compute the potential function for this field whose potential at the origin is -1 .

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

- 1) -806.161 2) -375.761 3) -268.161 4) -1209.66
- 5) The vector field is not conservative.

Further Mathematics - Degree in Engineering - 2025/2026
 03-04-Differential Geometry-Line/Surface integral-Handwritten
 training exam for serial number: 14

Exercise 1

Compute the center of curvature for $C(t) = \{-3 + 3t, -3t^2, -2t^2\}$ at the point $t = -1$.

- 1) $\{15.7333, -17.0385, -3.89231\}$
- 2) $\{4.53333, 1.16154, -5.29231\}$
- 3) $\{17.1333, -14.2385, -19.2923\}$
- 4) $\{14.3333, -10.0385, -6.69231\}$
- 5) $\{17.1333, -1.63846, 4.50769\}$

Exercise 2

Compute the Gauss curvature for $X(u,v) = \{\cos[u], \sin[u], v\}$ at the point $(u,v) = (5, 3)$.

- 1) $K(5, 3) = 8.37111$
- 2) $K(5, 3) = -8.44939$
- 3) $K(5, 3) = -5.78004$
- 4) $K(5, 3) = 0$
- 5) $K(5, 3) = 4.90069$

Exercise 3

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

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

- 1) -118 . 2) -236 . 3) -1156.4 4) -967.6
- 5) The vector field is not conservative.

Further Mathematics - Degree in Engineering - 2025/2026
 03-04-Differential Geometry-Line/Surface integral-Handwritten
 training exam for serial number: 15

Exercise 1

Compute the center of curvature for $C(t) = \{-2t^2, 3-t, 2t^2\}$ at the point $t=0$.

- 1) $\{-2.225, 2.1, 1.025\}$
- 2) $\{-0.125, 3., 0.125\}$
- 3) $\{-2.525, 2.7, 2.825\}$
- 4) $\{-1.325, 2.7, -2.575\}$
- 5) $\{-2.825, 4.5, -1.675\}$

Exercise 2

Compute the Gauss curvature for $X(u,v) = \{3u, 3u^2, v\}$ at the point $(u,v) = (3, 5)$.

- 1) $K(3, 5) = 0$
- 2) $K(3, 5) = 5.53632$
- 3) $K(3, 5) = 7.7297$
- 4) $K(3, 5) = -2.40353$
- 5) $K(3, 5) = 1.51416$

Exercise 3

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

$$\left(\frac{y(xy-y)}{xy+1} + y \log(xy+1), \frac{x(xy-y)}{xy+1} + (x-1) \log(xy+1) \right)$$

. Compute the potential function for this field whose potential at the origin is 1.

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

- 1) 579.055 2) 590.855 3) 118.855 4) -294.145
- 5) The vector field is not conservative.

Further Mathematics - Degree in Engineering - 2025/2026

03-04-Differential Geometry-Line/Surface integral-Handwritten training exam for serial number: 16

Exercise 1

Compute the center of curvature for $C(t) = \{-3t^2, 1-2t, 2t^2\}$ at the point $t = -1$.

- 1) $\{10.5385, -12.5, -8.69231\}$
- 2) $\{13.0385, -5., 16.3077\}$
- 3) $\{-19.4615, -45., 28.8077\}$
- 4) $\{-9.46154, -25., 6.30769\}$
- 5) $\{-21.9615, -22.5, 26.3077\}$

Exercise 2

Compute the Gauss curvature for $X(u,v) = \{3u, u, v\}$ at the point $(u,v) = (8, 1)$.

- 1) $K(8, 1) = -6.44879$
- 2) $K(8, 1) = -2.01698$
- 3) $K(8, 1) = 3.066$
- 4) $K(8, 1) = 7.45885$
- 5) $K(8, 1) = 0$

Exercise 3

Consider the vectorial field $F(x, y) = (-y(-xy - 3y) \sin(xy) - y \cos(xy) + 6x + 1, (-x - 3) \cos(xy) - x(-xy - 3y) \sin(xy))$. 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 $[0, 1]^2$.

- 1) -5.09898 2) -29.099 3) -23.699 4) 15.901
- 5) The vector field is not conservative.

Further Mathematics - Degree in Engineering - 2025/2026
 03-04-Differential Geometry-Line/Surface integral-Handwritten
 training exam for serial number: 17

Exercise 1

Compute the center of curvature for $C(t) = \{-t^2, -2t^2, 2+3t\}$ at the point $t = -2$.

- 1) $\{36.6, 7.2, 27.8333\}$
- 2) $\{20.1, 18.2, 88.3333\}$
- 3) $\{-51.4, -20.3, 77.3333\}$
- 4) $\{-1.9, -47.8, 27.8333\}$
- 5) $\{-12.9, -25.8, 55.3333\}$

Exercise 2

Compute the mean curvature for $X(u,v) = \{e^u \cos[u], e^u \sin[u], v\}$ at the point $(u,v) = (1, 8)$.

- 1) $H(1, 8) = 2.33213$
- 2) $H(1, 8) = 1.29988$
- 3) $H(1, 8) = 2.04961$
- 4) $H(1, 8) = 0$
- 5) $H(1, 8) = 8.08179$

Exercise 3

Consider the vectorial field $F(x, y) = (2 - 6xy, -3x^2)$

. 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 $[0,1]^2$.

- 1) 12. 2) 5.5 3) 6.5 4) -2.
- 5) The vector field is not conservative.

Further Mathematics - Degree in Engineering - 2025/2026

03-04-Differential Geometry-Line/Surface integral-Handwritten training exam for serial number: 18

Exercise 1

Compute the center of curvature for $C(t) = \{2t^2, -3t^2, -3-t\}$ at the point $t=0$.

- 1) $\{-1.12308, 1.38462, -1.5\}$
- 2) $\{0.0769231, -0.115385, -3.\}$
- 3) $\{0.976923, -1.61538, -4.5\}$
- 4) $\{1.57692, 0.784615, -5.4\}$
- 5) $\{-1.42308, -2.21538, -5.7\}$

Exercise 2

Compute the mean curvature for $X(u,v) = \{\cos[u], \sin[u], v\}$ at the point $(u,v) = (3, 6)$.

- 1) $H(3, 6) = -3.46713$
- 2) $H(3, 6) = 0.5$
- 3) $H(3, 6) = -5.194$
- 4) $H(3, 6) = 8.48961$
- 5) $H(3, 6) = -3.38656$

Exercise 3

Consider the vectorial field $F(x, y) = (3y \sin(xy) + y(3xy + 3y) \cos(xy) + 6x + 3, (3x + 3) \sin(xy) + x(3xy + 3y) \cos(xy))$. 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 $[0, 1]^2$.

- 1) 2.48942 2) 2.88942 3) 1.08942 4) -1.71058
- 5) The vector field is not conservative.

Further Mathematics - Degree in Engineering - 2025/2026
 03-04-Differential Geometry-Line/Surface integral-Handwritten
 training exam for serial number: 19

Exercise 1

Compute the center of curvature for $C(t) = \{-t^2, -3-t, -2t^2\}$ at the point $t=0$.

- 1) $\{1.7, -2.4, 1.3\}$
- 2) $\{1.1, -5.4, -0.5\}$
- 3) $\{-2.2, -3.3, 2.5\}$
- 4) $\{-1.6, -2.4, 0.7\}$
- 5) $\{-0.1, -3., -0.2\}$

Exercise 2

Compute the mean curvature for $X(u,v) = \{3u, u^2, v\}$ at the point $(u,v) = (1, 4)$.

- 1) $H(1, 4) = 0.0640039$
- 2) $H(1, 4) = 3.54322$
- 3) $H(1, 4) = -5.12829$
- 4) $H(1, 4) = 3.54573$
- 5) $H(1, 4) = 3.55925$

Exercise 3

Consider the vectorial field $F(x, y) = (6xy^2 \sin(xy) - 6y \cos(xy) + 1, 6x^2y \sin(xy) - 6x \cos(xy))$. 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 $[0,1]^2$.

- 1) -7.81932 2) -13.0193 3) -3.81932 4) 6.18068
- 5) The vector field is not conservative.

Further Mathematics - Degree in Engineering - 2025/2026

03-04-Differential Geometry-Line/Surface integral-Handwritten training exam for serial number: 20

Exercise 1

Compute the center of curvature for $C(t) = \{-t^2, 3t^2, -2-t\}$ at the point $t = -1$.

- 1) $\{-24.05, 25.95, -63.\}$
- 2) $\{-3.05, 9.15, -42.\}$
- 3) $\{13.75, -11.85, -21.\}$
- 4) $\{-40.85, -20.25, -29.4\}$
- 5) $\{-32.45, -3.45, -33.6\}$

Exercise 2

Compute the Gauss curvature for $X(u,v) = \{v \cos[u], v \sin[u], v\}$ at the point $(u,v) = (1, 9)$.

- 1) $K(1, 9) = 0.578749$
- 2) $K(1, 9) = 6.14632$
- 3) $K(1, 9) = 8.99915$
- 4) $K(1, 9) = 5.49947$
- 5) $K(1, 9) = 0$

Exercise 3

Consider the vectorial field $F(x, y) = (-y(3y-3)\sin(xy), 3\cos(xy) - x(3y-3)\sin(xy))$. Compute the potential function for this field whose potential at the origin is -7 .

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

- 1) 9.57024 2) 28.4702 3) 5.07024 4) -1.22976
- 5) The vector field is not conservative.