Online Homework

Online Problems

Problem   **1**   *Compute the curl of the vector field* $\mathbf{F}(x, y, z) = (-2y\cos(3x), 3x\sin(-2y), 0)$.

$$\nabla \times \mathbf{F} = \boxed{(0, 0, 2\cos(3x) - 3\sin(2y)}$$

Find the curl of $\mathbf{F}$ *at the point* $(x, y, z) = (\pi, \pi, \pi)$.

$$(\nabla \times \mathbf{F})(\pi, \pi, \pi) = \boxed{(0, 0, -2}$$

Is $\mathbf{F}$ *a conservative vector field?*

Multiple Choice:

  (a) *Yes.*

  (b) *No.* ✓

  (c) *Not enough information.*

Justify your answer.

Free Response:

Problem   **2**   *Compute the curl of the vector field* $\mathbf{F}(x, y, z) = (yz, 2xz, 3xy)$.

$$\nabla \times \mathbf{F} = \boxed{(x, -2y, z)}$$

Find the curl of $\mathbf{F}$ *at the point* $(x, y, z) = (0, 0, 0)$.

$$\nabla \times \mathbf{F} = \boxed{(0, 0, 0)}$$

Is $\mathbf{F}$ *irrotational?*

Multiple Choice:

(a) *Yes.*

(b) *No.* ✓

(c) *Not enough information.*

Problem 3 *Compute the curl of the vector field* $\mathbf{F}(x, y, z) = (x^2, y^3, z^4)$.

$$\nabla \times \mathbf{F} = \boxed{(0, 0, 0)}.$$

Find the curl of $\mathbf{F}$ *at the point* $(x, y, z) = (1, 2, 3)$.

$$(\nabla \times \mathbf{F})(1, 2, 3) = \boxed{(0, 0, 0)}.$$

Is $\mathbf{F}$ *irrotational?*

Multiple Choice:

(a) *Yes.* ✓

(b) *No.*

(c) *Not enough information.*

Problem 4 *Compute the two-dimensional curl of the vector field* $\mathbf{F}(x, y) = (-xy, xy)$.

$$\nabla \times \mathbf{F} = \left(0, 0, \boxed{x + y}\right)$$

Describe the local rotation of $\mathbf{F}$ *at the point* $(1, 1)$.

Multiple Choice:

(a) *Counterclockwise.* ✓

(b) *Clockwise.*

(c) *No rotation.*

Describe the local rotation of $\mathbf{F}$ *at the point* $(-1, 1)$.

Multiple Choice:

(a) *Counterclockwise.*

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(b) *Clockwise.*

(c) *No rotation.* ✓

Describe the local rotation of **F** *at the point* $(-1, -1)$.

Multiple Choice:

(a) *Counterclockwise.*

(b) *Clockwise.* ✓

(c) *No rotation.*

Problem 5 *Compute the curl of the vector field* $\mathbf{F}(x, y) = (2x - y, -x + 4y)$.

$$\nabla \times \mathbf{F} = (0, 0, \boxed{0})$$

Is **F** *conservative?*

Multiple Choice:

(a) *Yes.* ✓

(b) *No.*

Problem 5.1 *Find a potential function* f *for* **F**, *so that* $\nabla f = \mathbf{F}$.

$$f(x, y) = \boxed{x^2 - xy + 2y^2}$$

Problem 6 *Compute the curl of the vector field* $\mathbf{F}(x, y) = (2y, 3x)$.

$$\nabla \times \mathbf{F} = (0, 0, \boxed{1})$$

Is **F** *conservative?*

Multiple Choice:

(a) *Yes.*

(b) *No.* ✓

Problem   7   *Compute the curl of the vector field* $\mathbf{F}(x, y) = (2x, 3y)$.

$$\nabla \times \mathbf{F} = (0, 0, \boxed{0})$$

Is $\mathbf{F}$ *conservative?*

Multiple Choice:

(a) *Yes.* ✓

(b) *No.*

Problem   7.1   *Find a potential function* f *for* $\mathbf{F}$, *so that* $\nabla f = \mathbf{F}$.

$$f(x, y) = \boxed{x^2 + \frac{3}{2}y^2}$$

Problem   8   *Compute the curl of the vector field* $\mathbf{F}(x, y) = (-4x + y\cos(x), \sin(x))$.

$$\nabla \times \mathbf{F} = (0, 0, \boxed{0})$$

Is $\mathbf{F}$ *conservative?*

Multiple Choice:

(a) *Yes.* ✓

(b) *No.*

Problem   8.1   *Find a potential function* f *for* $\mathbf{F}$, *so that* $\nabla f = \mathbf{F}$.

$$f(x, y) = \boxed{-2x^2 + y\sin(x)}$$

Problem 9 *Compute the curl of the vector field* $\mathbf{F}(x, y, z) = (\sin(x), y^2, e^z)$.

$$\nabla \times \mathbf{F} = \boxed{(0, 0, 0)}$$

Is $\mathbf{F}$ *conservative?*

Multiple Choice:

(a) *Yes.* ✓

(b) *No.*

Problem 9.1 *Find a potential function* f *for* $\mathbf{F}$, *so that* $\nabla f = \mathbf{F}$.

$$f(x, y, z) = \boxed{-\cos(x) + \frac{1}{2}y^2 + e^z}$$