

(An Autonomous Institution) Coimbatore-641035.

**UNIT-I Vector calculus** 

Divergence and curl of vector field

Divergence of a vector point function

tet F' be any given continuously differentiable point function then the divergence of  $\vec{F}$ 'u defined as  $\vec{F} = \nabla \cdot \vec{F} = \vec{1} \cdot \frac{\partial F_1}{\partial x} + \vec{j} \cdot \frac{\partial F_2}{\partial y} + \vec{k} \cdot \frac{\partial F_3}{\partial z}$ senstal by the support of the matter of the partie

det a vector F' is said to be solenoidal 

tunt of a vector point spunction pour mounts along site  $F = F_1 \vec{i} + F_2 \vec{j} + F_3 \vec{k}$  be any given continuosly differentiable vector point junction then in the un or notation of the six defined by

$$\vec{F} = \nabla \times \vec{F} = \begin{bmatrix} \vec{7} & \vec{7} & \vec{F} \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ \vec{F}_1 & \vec{F}_2 & \vec{F}_3 \end{bmatrix}$$

Irriotational vector

A vector F is said to be vocotational if

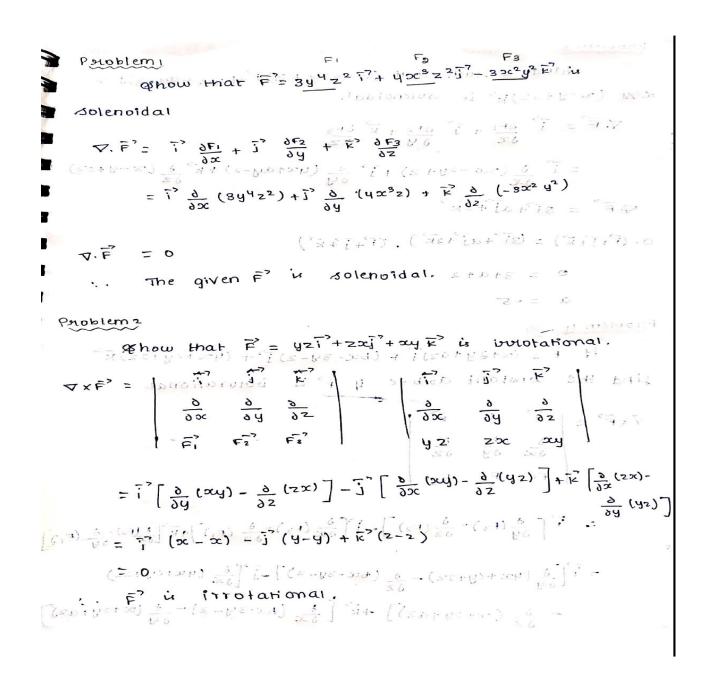


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Hind a ruch that (3x-2y+z) 12+(4x+ay-2) 12+ \$6.74 (x-4+22) x> is solenoidal.

$$\nabla \cdot \vec{F} = \vec{i} \frac{\partial F_1}{\partial x} + \vec{j} \frac{\partial F_2}{\partial y} + \vec{k} \frac{\partial F_3}{\partial z}$$

$$= \vec{i} \frac{\partial}{\partial x} (3x - 2y + z) + \vec{j} \frac{\partial}{\partial y} (4x + 4y - z) + \vec{k} \frac{\partial}{\partial z} (x - y + zz)$$

$$\nabla \cdot \vec{F} = 3\vec{i} + 4\vec{j} + 2\vec{k}$$

$$0 - (\vec{1} + \vec{1} + \vec{k}) = (\vec{3} + \vec{4} + \vec{2} + \vec{4}) \cdot (\vec{1} + \vec{1} + \vec{k})$$

$$0 = 3 + \alpha + 2 \text{ Jabitanslos.} \quad \vec{k} = \vec{7} \text{ maying sites.}$$

$$\alpha = -5$$

$$\nabla \times \vec{F}^{2} = \begin{bmatrix} -6 \\ -6 \end{bmatrix} \quad \begin{bmatrix} -6 \\ -6 \end{bmatrix} \quad$$

$$= i \left[ \frac{\partial}{\partial y} (F_3) - \frac{\partial}{\partial z} (F_2) \right] - i \left[ \frac{\partial}{\partial x} (F_3) - \frac{\partial}{\partial z} (F_1) \right] + k \left[ \frac{\partial}{\partial x} (F_3) - \frac{\partial}{\partial y} (F_1) \right]$$

$$= i \left[ \frac{\partial}{\partial y} (yx + (y + 2z)) - \frac{\partial}{\partial z} (bx - 3y - z) \right] - i \left[ \frac{\partial}{\partial x} (yx + (y + 2z)) - \frac{\partial}{\partial z} (xy + 2y + 2z) \right]$$

$$= \frac{\partial}{\partial z} (x + 2y + 2z) + k \left[ \frac{\partial}{\partial x} (bx - 3y - z) - \frac{\partial}{\partial y} (xy + 2y + 2z) \right]$$



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$$0 = \frac{1}{1}(c+1) - \frac{1}{2}(4-a) + \frac{1}{k}(b-2)$$

$$c+1 = 0 \qquad -4+a = 0 \qquad b-2 = 0$$

$$c = -1 \qquad a = 4 \qquad b = 2$$