Metca NANE 2. Sınıf EHM 397295 1.1

$\vec{F} = 2x^2y \cdot (\hat{i}) + 3y^2z\,(\hat{j}) - 4z^2x\,(\hat{k})$

a) $\vec{\nabla} \cdot \vec{F} = ?$ (1, 2, 1) Kartezyen

b) $\vec{\nabla} \cdot \vec{F} = ?$ (2, -π/3, π/4) Küresel

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

$$\vec{\nabla} \cdot \vec{F} = 2y \cdot 2x + 3z \cdot 2y - 4x \cdot 2z$$

$$\vec{\nabla} \cdot \vec{F} = 4xy \cdot (\hat{i}) + 6yz \cdot (\hat{j}) - 8xz\,(\hat{k})$$

$$\vec{\nabla} \cdot \vec{F} \underset{(1,2,1)}{=} 4 \cdot 1 \cdot 2 \cdot (\hat{i}) + 6 \cdot 2 \cdot 1 \cdot (\hat{j}) - 8 \cdot 1 \cdot 1 \cdot (\hat{k})$$

$\vec{\nabla} \cdot \vec{F} = 8\hat{i} + 12\hat{j} - 8\hat{k}$ Vektörel

$\vec{\nabla} \cdot \vec{F} = 8 + 12 - 8 = 12$ Skaler

$x = r \cdot \sin\theta \cdot \cos\phi$

$y = r \cdot \sin\theta \cdot \sin\phi$

$z = r \cdot \cos\theta$

Yeri belirleyeceğimiz değerlerdir.

1.1

$x^* = 2 \cdot \sin(\pi/3) \cdot \cos(\pi/4) = 1{,}224$

$y^* = 2 \cdot \sin(\pi/3) \cdot \sin(\pi/4) = 1{,}224$

$z^* = 2 \cdot \cos(\pi/3) = 1$

$\vec{\nabla} \times \vec{F}_{(x^*, y^*, z^*)} = \vec{\nabla} \times \vec{F}_{(1{,}224;\ 1{,}224;\ 1)}$

$\vec{\nabla} \times \vec{F} = 4xy\,(\vec{i}) + 6yz \cdot (\vec{j}) - 8xz\,(\vec{k})$

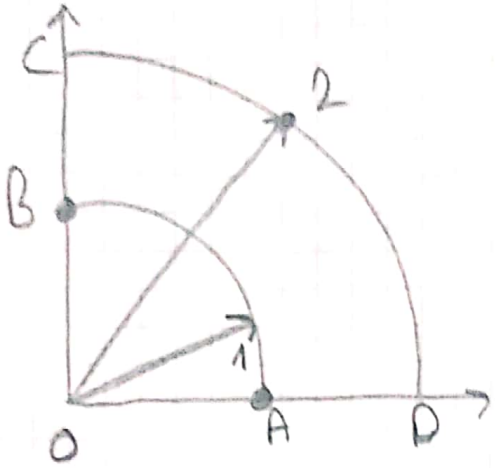
$\vec{\nabla} \times \vec{F}_{(x^*, y^*, z^*)} = 4 \cdot 1{,}224 \cdot 1{,}224\,(\vec{i}) + 6 \cdot 1{,}224 \cdot 1 \cdot (\vec{j}) - 8 \cdot 1{,}224 \cdot 1 \cdot (\vec{k})$

$= 5{,}992\,(\vec{i}) + 7{,}344 \cdot (\vec{j}) - 9{,}792 \cdot (\vec{k})$

Vektörel

$= 3{,}544$ Skaler

Mertcan NANE 2.Sınıf EHM 397295 2.1



$\vec{F} = 5r\sin\phi \cdot \hat{\partial}r + r^2 \cdot \cos\phi \cdot \hat{\partial}\phi$

A) $\int F \cdot d\vec{\ell} = ?$

B) $\nabla \times \vec{F}$'yi bulunuz.

AB yolu için;

$r = 1$, $\vec{F} = 5\sin\phi \cdot (\hat{\partial}r) + \cos\phi \cdot (\hat{\partial}\phi)$

$d\ell = \hat{\partial}\phi \cdot d\phi$

$$\int_{AB\ yolu} \vec{F} \cdot d\vec{\ell} = \int_0^{\pi/2} \cos\phi \cdot d\phi = \sin x \Big|_0^{\pi/2} = 1 - 0 = 1$$

BC yolu için;

$\phi = \pi/2$, $\vec{F} = 5r \cdot \hat{\partial}r \cdot \underbrace{\sin(\pi/2)}_{1} + r^2 \cdot \underbrace{\cos(\pi/2)}_{0} \cdot \partial\phi$

$\vec{F} = 5r \cdot \hat{\partial}r$

$d\vec{\ell} = \hat{\partial}r \cdot dr$

$$\int_{BC\ yolu} \vec{F} \cdot d\ell = \int_1^2 5r \cdot dr = \frac{5r^2}{2}\Big|_1^2$$

$\frac{20}{2} - \frac{5}{2} = 15/2$

CD yolu için;

$r=2 \quad \vec{F} = 10\cdot\sin\phi\cdot(\hat{\partial}r) + 4\cos\phi\cdot(\hat{\partial}\phi)$

$d\ell = \hat{\partial}\phi \cdot 2 \cdot d\phi \quad \int_{CD\ yolu} F\cdot d\vec{\ell} = \int_{\pi/2}^{0} 8\cos\phi\cdot d\phi =$

$= 8\cdot\left(\sin\phi\Big|_{\pi/2}^{0}\right)$

$= 8\cdot(\sin 0 - \sin(\pi/2)) = -8$

DA yolu için;

$\phi = 0 \ , \ \vec{F} = \partial\phi \cdot r^2$

$\int_{DA\ yolu} F\cdot d\vec{\ell} = 0 \ , d\ell = \hat{\partial}r\cdot dr$ bileşeni yok o yüzden direkt sıfır gelir

$AB + BC + CD + DA = 1 + 15\,12 - 8 + 0 = 112$

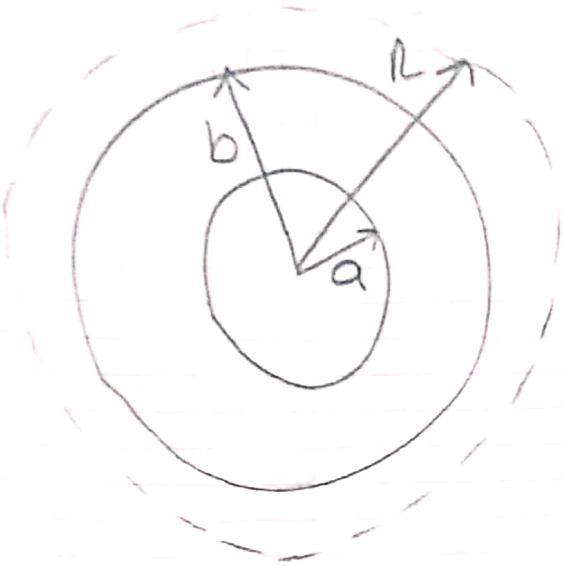
$$\vec{\nabla}\times\vec{F} = \begin{vmatrix} \hat{x} & \hat{y} & \hat{z} \\ \partial x & \partial y & \partial z \\ Fx & Fy & Fz \end{vmatrix} = \begin{vmatrix} (+1)\,\hat{x} & (-1)\,\hat{y} & (+1)\,\hat{z} \\ \partial r & \partial\phi & \partial z \\ 5r\cdot\sin\phi & r^2\cdot\cos\phi & 0 \end{vmatrix}$$

$\hat{\partial}r\cdot(0-0) + \hat{\partial}\phi\cdot(0-0) + \hat{\partial}z\cdot(3r-5)\cdot\cos\phi$

$= \hat{\partial}r\cdot(0) + \hat{\partial}\phi\cdot(0) + \hat{\partial}z\cdot(3r\cos\phi - 5\cos\phi)$

Merica NANE 2. SINIF ENM 397295 3.1

$r=0$, $b>a$, ρ_{sa} ve ρ_{sb}
$r=b$



Gauss yasası uygularsa $E = \hat{\theta}r \cdot E_r$

$r<a$ için $E_R = 0$

$a<r<b$ için $E_r = \dfrac{a \cdot \rho_{sa}}{\varepsilon_0 \cdot r}$

$r>b$ için $E_r = \dfrac{a \cdot \rho_{sa} + b \cdot \rho_{sb}}{\varepsilon_0 \cdot r}$ olur.

$r>b$ için E'nin sıfırlanması için ;

$\dfrac{b}{a} = \dfrac{-\rho_{so}}{\rho_{sb}}$ olmalıdır.

Metca NANE 2. Sınıf EHM 39725 4.1

$\varepsilon_{r1} = 2$

$\varepsilon_{r2} = 3$

$\vec{E_1} = \hat{\partial}x \cdot (2y) - \hat{\partial}y \cdot (3x) + \hat{\partial}z \cdot (5+z)$

$\vec{E_2}$ ve $\vec{D} = ?$

$E_{1t} = E_{2t}$

$D_{1n} - D_{2n} = \rho_s$

$\vec{D} = \varepsilon \cdot \vec{E}$

$D_1 = \hat{\partial}x \cdot (4y) - \hat{\partial}y \cdot (6x) + \hat{\partial}z \cdot (10+2z)$

$E_{1t} = E_{2t} = \hat{\partial}x \cdot (2y) - \hat{\partial}y \cdot (3x)$

$E_{1n} = +\hat{\partial}z \cdot (5+z)$

$D_{1n} = +\hat{\partial}z \cdot (10+2z) \cdot \varepsilon_0 = D_{2n}$

$E_{2n} = \dfrac{D_{2n}}{\varepsilon_0 \cdot \varepsilon_{r2}} = +\hat{\partial}z \cdot (10/3 + 2/3 z)$

$\vec{E_2} = \hat{\partial}x \cdot (2y) - \hat{\partial}y \cdot (3x) + \hat{\partial}z \cdot (10/3 + 2/3 \cdot z)$

$\vec{D_2} = \hat{\partial}x \cdot (6y) \cdot \varepsilon_0 - \hat{\partial}y \cdot (9x) \cdot (\varepsilon_0) + \partial z \cdot (10+2z) \cdot (\varepsilon_0)$

NOT

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