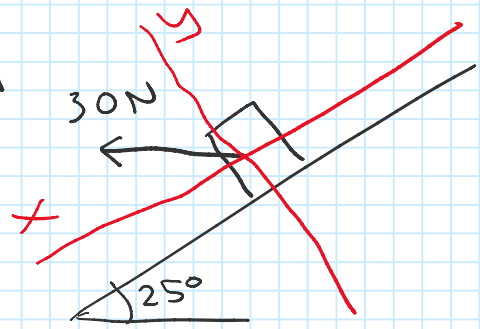
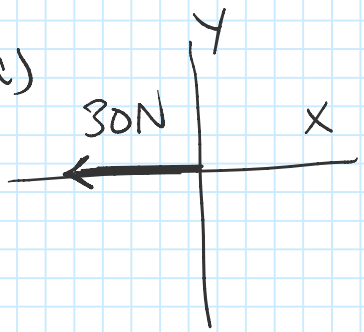
OH Notes 09.18

Friday, September 18, 2020 3:01 PM

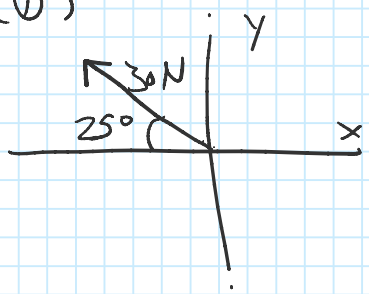
#31



(a)



(b)



Quiz week 2

(a) $f(x,y,z) = x^3 + (2y^2)z^3$

$= C + Cz^3$

$\frac{\partial f}{\partial z} = (2y^2)\,3z^2 = 6y^2z^2$

Cross-product

$\vec{D} = \langle 1, 2, 3 \rangle$ 3D

$\vec{E} = -4\hat{i} + 5\hat{j} + 0\hat{k}$ 2D

$$\vec{F} = \vec{D} \times \vec{E} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ D_x & D_y & D_z \\ E_x & E_y & E_z \end{vmatrix} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 2 & 3 \\ -4 & 5 & 0 \end{vmatrix}$$

Always 3 x 3 (3 = # columns = # rows)

↑ # columns
rows

$= \hat{i}(2\cdot 0 - 3\cdot 5) - \hat{j}(1\cdot 0 - 3\cdot(-4)) + \hat{k}(1\cdot 5 - 2(-4))$

$= -15\hat{i} - 12\hat{j} + 13\hat{k}$

$= \langle -15, -12, 13 \rangle$

$F_x \quad F_y \quad F_z$

In general, magnitude of vector

$$F = \sqrt{F_x^2 + F_y^2 + F_z^2}$$

$$= \sqrt{(-15)^2 + (-12)^2 + 13^2} = \sqrt{538}$$

Magnitude of cross product.

$$|\vec{F}| = |\vec{D} \times \vec{E}| = DE\sin\theta$$

θ = angle between $\vec{D}$ & $\vec{E}$

$$D = \sqrt{1^2 + 2^2 + 3^2} = \sqrt{14}$$

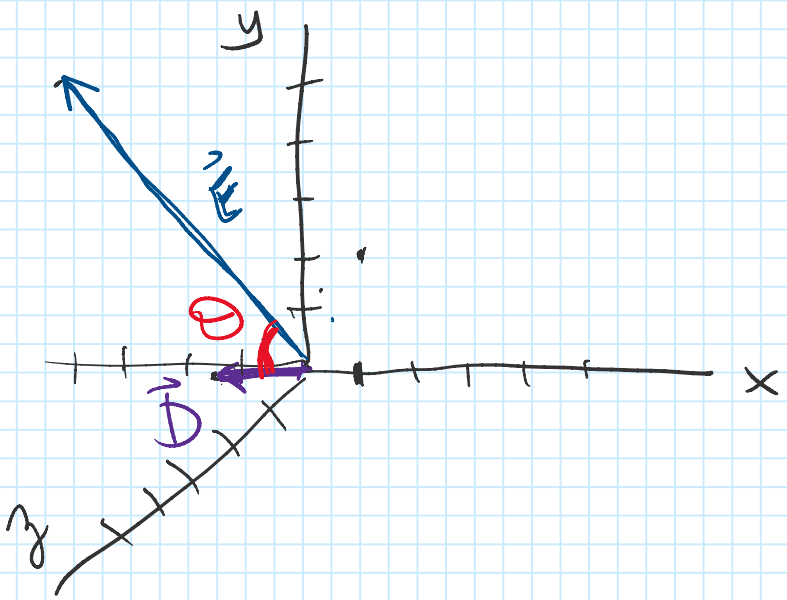
$$E = \sqrt{(-4)^2 + 5^2 + 0} = \sqrt{41}$$

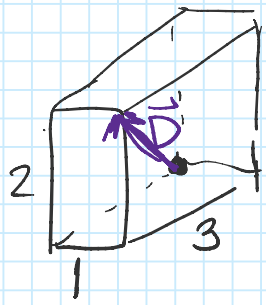
$$\sqrt{538} = \sqrt{14}\sqrt{41}\sin\theta$$

$$\theta = \sin^{-1}\left(\frac{\sqrt{538}}{\sqrt{14}\sqrt{41}}\right)$$

$$\theta = 75.5^\circ$$

$\vec{D} = \langle 1, 2, 3 \rangle \quad \vec{E} = \langle -4, 5, 0 \rangle$


y
x
z
$\vec{E}$
θ
$\vec{D}$


2
1
3
$\vec{D}$