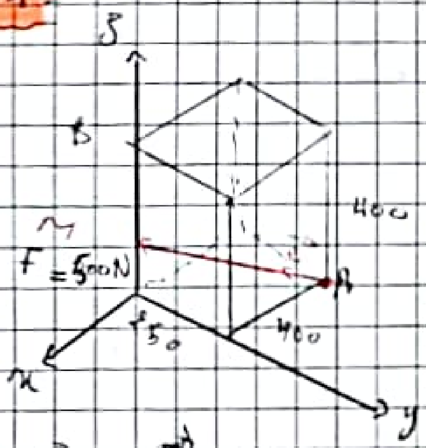
Ex1:



$\vec{AM} = |\vec{AM}| \cdot \vec{e}$

$A(-400, 250, 0)$

$M(0, 0, 200)$

$$\vec{AM} = \begin{pmatrix} 0 \\ 0 \\ 200 \end{pmatrix} - \begin{pmatrix} -400 \\ 250 \\ 0 \end{pmatrix} = \begin{pmatrix} 400 \\ -250 \\ 200 \end{pmatrix}$$

$|\vec{AM}| = \sqrt{x^2 + y^2 + z^2}$

$= \sqrt{(400)^2 + (-250)^2 + (200)^2} = 512,35$

$$\vec{e} = \frac{\vec{AM}}{|\vec{AM}|} = \begin{pmatrix} 400/512,35 \\ -250/512,35 \\ 200/512,35 \end{pmatrix}$$

$$\vec{e} = \begin{pmatrix} 0,78 \\ -0,48 \\ 0,39 \end{pmatrix}$$

$\vec{F} = 500 \vec{e}$ [N]

$$= 500 \begin{Bmatrix} 0,78 \\ -0,48 \\ 0,39 \end{Bmatrix}$$

$$\boxed{\vec{F} = 390 \vec{i} - 240 \vec{j} + 195 \vec{k}}$$

Ex2:

$A(1, 2, -1)$

$B(0, 3, 4)$

$C(-2, 2, 1)$

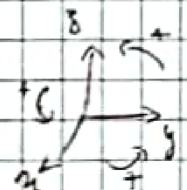
Determine the coordinates of point $D(x, y, z)$ such as a vector $\vec{CD}$ is the unit vector of $\vec{AB}$

$$\vec{AB} = \begin{pmatrix} -1 \\ 1 \\ 5 \end{pmatrix}$$

$\vec{AB} = \sqrt{1 + 1 + 25} = \sqrt{27} = 5,19$

$$\vec{e}_{AB} = \begin{pmatrix} -1/\sqrt{27} \\ 1/\sqrt{27} \\ 5/\sqrt{27} \end{pmatrix} = \begin{pmatrix} -0,192 \\ 0,192 \\ 0,962 \end{pmatrix}$$

$$\vec{CD} = \left(\begin{array}{c|c} x & -2 \\ y & 2 \\ z & 1 \end{array}\right) = \begin{pmatrix} -0,192 \\ 0,192 \\ 0,962 \end{pmatrix}$$



Ex3:

$\vec{u} \begin{Bmatrix} 2 \\ -3 \\ 5 \end{Bmatrix}$, $\vec{v} \begin{Bmatrix} 3 \\ y \\ -2 \end{Bmatrix}$ are perpendicular, for that determine (y)

$$\vec{u} \cdot \vec{v} = \begin{pmatrix} 2 \\ -3 \\ 5 \end{pmatrix} \cdot \begin{pmatrix} 3 \\ y \\ -2 \end{pmatrix} = 6 - 3y - 10 = 0$$

$$\boxed{y = -\frac{4}{3} = -1,33}$$

Ex4:

$\vec{A} \begin{pmatrix} 0 \\ 3 \\ 1 \end{pmatrix}$ $\vec{B} \begin{pmatrix} 0 \\ 1 \\ 2 \end{pmatrix}$

calculate $\vec{A} \cdot \vec{B}$ and deduce θ

$\vec{A} \cdot \vec{B} = 0 + 3 + 2 = 5$

$|\vec{A}| = \sqrt{10}$ $|\vec{B}| = \sqrt{5}$

$\vec{A} \cdot \vec{B} = |\vec{A}| \, |\vec{B}| \cos\theta = \sqrt{10} \sqrt{5} \cos\theta$

$\theta = 45°$

$$\vec{C} = \vec{A} \wedge \vec{B} = \begin{pmatrix} x_A \\ y_A \\ z_A \end{pmatrix} \wedge \begin{pmatrix} x_B \\ y_B \\ z_B \end{pmatrix}$$

$$= \begin{pmatrix} y_A z_B - y_B z_A \\ \\ \\ \end{pmatrix}$$