EE3900-Assignment 1

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Download all latex-tikz codes from

https://github.com/vaishnavi−w/EE3900/blob/main/Assignment1/latex1.tex

1 Vectors 2.22

Find a unit vector in the direction of the line passing through $\begin{pmatrix}-2\\4\\-5\end{pmatrix}$ and $\begin{pmatrix}1\\2\\3\end{pmatrix}$

2 Solution

Let the points be $\mathbf{P} = \begin{pmatrix}-2\\4\\-5\end{pmatrix}$ and $\mathbf{Q} = \begin{pmatrix}1\\2\\3\end{pmatrix}$.

The direction vector for the line through the points $\mathbf{P}$ and $\mathbf{Q}$ is

$$\mathbf{A} = \mathbf{P} - \mathbf{Q} \tag{2.0.1}$$

$$\implies \mathbf{A} = \begin{pmatrix}-2\\4\\-5\end{pmatrix} - \begin{pmatrix}1\\2\\3\end{pmatrix} \tag{2.0.2}$$

$$\implies \mathbf{A} = \begin{pmatrix}-3\\2\\-8\end{pmatrix} \tag{2.0.3}$$

The unit vector is

$$\hat{\mathbf{A}} = \frac{\mathbf{A}}{\|\mathbf{A}\|} \tag{2.0.4}$$

Also,

$$\|\boldsymbol{A}\| = \sqrt{(-3)^2 + (2)^2 + (-8)^2} = \sqrt{77} \tag{2.0.5}$$

Hence, from (2.0.3) and (2.0.5) we have

$$\hat{\mathbf{A}} = \begin{pmatrix}\frac{-3}{\sqrt{77}}\\\frac{2}{\sqrt{77}}\\\frac{-8}{\sqrt{77}}\end{pmatrix} \tag{2.0.6}$$