Assignment 1

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Download all python codes from

https://github.com/neharani289/ee14014/Assignment1/codes

and latex-tikz codes from

https://github.com/neharani289/ee14014/Assignment1

Q no. 46. what are the points on the y-axis whose distance from the line (4 3)x = 12 is 4 units.

Solution:

Here ,direction vectors of the lines are $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$ normal vector n is given by,

$$n = \begin{pmatrix} 4 \\ 3 \end{pmatrix} \tag{0.0.1}$$

now distance between a given line which meet y-axis at point $P_1 and desired point \mathbf{P_2} and \mathbf{P_3}$

$$d = \frac{(\mathbf{P_1} - \mathbf{P_2})^T n}{\|n\|} \tag{0.0.2}$$

$$\implies 4 = \frac{\begin{pmatrix} 0 & (4-a) \end{pmatrix}^T \begin{pmatrix} 4 \\ 3 \end{pmatrix}}{5} \implies 20 = 12 - 3a \tag{0.0.3}$$

$$a = -8/3 \tag{0.0.4}$$

similarly distance between given line and the desired point P3 can be calculated as:

$$d = \frac{(\mathbf{P_3} - \mathbf{P_1})^T n}{\|n\|} \tag{0.0.5}$$

$$\implies 4 = \frac{\begin{pmatrix} 0 & (b-4) \end{pmatrix}^T \begin{pmatrix} 4 \\ 3 \end{pmatrix}}{5} \tag{0.0.6}$$

$$20 = 3b - 12 \tag{0.0.7}$$

$$b = 32/3 \tag{0.0.8}$$

therefore points on y-axis at 4 units distance from line are (0,-8) and (0,32/3).