Assignment 1

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Download all python codes from

https://github.com/aayush-1/EE5609-Matrix-Theory/tree/master/codes

and latex-tikz codes from

https://github.com/aayush-1/EE5609-Matrix-Theory

1 Question No. 34

Find the points on the x-axis, whose distances from the line

$$(4 \ 3) \mathbf{x} = 12 \tag{1.0.1}$$

are 4 units.

2 EXPLANATION

First we can find the lines at a distance of 4 from the given line and then it's intersection with the xaxis.

$$\mathbf{n} = \begin{pmatrix} -4 \\ 3 \end{pmatrix}$$

The parallel lines must have the same slope but different intercepts. Hence the lines must be of the form:

$$(4 \ 3)\mathbf{x} = c_1$$
 (2.0.1)
 $(4 \ 3)\mathbf{x} = c_2$ (2.0.2)

$$\begin{pmatrix} 4 & 3 \end{pmatrix} \mathbf{x} = c_2 \tag{2.0.2}$$

These c1 and c2 can be easily found by evaluating the distance between the parallel lines:

$$\frac{|(c-12)|}{\sqrt{4^2+3^2}} = 4 \tag{2.0.3}$$

The equation of the parallel lines in terms of the given line is then obtained as

$$(4 \ 3) \mathbf{x} = 12 \pm \| (3 \ 4) \| 4$$
 (2.0.4)

$$(4 \ 3) \mathbf{x} = 12 \pm (\sqrt{4^2 + 3^2}) 4$$
 (2.0.5)

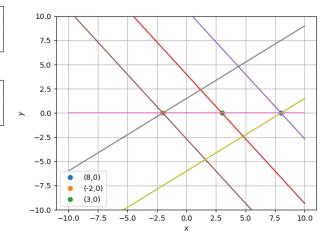


Fig. 0: Points on x-axis at a distance of 4 from the given line

The two parallel lines at a distance of 4 thus obtaine d are:

$$(4 \ 3) \mathbf{x} = 32 \tag{2.0.6}$$

$$\begin{pmatrix} 4 & 3 \end{pmatrix} \mathbf{x} = -8 \tag{2.0.7}$$

Finally the points on x-axis are:

$$\mathbf{x} = 8 \tag{2.0.8}$$

$$\mathbf{x} = -2 \tag{2.0.9}$$