

# 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

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

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 x-axis.

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

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

$$(4 \ 3)\mathbf{x} = \mathbf{c}_1 \quad (2.0.1)$$

$$(4 \ 3)\mathbf{x} = \mathbf{c}_2 \quad (2.0.2)$$

These  $c_1$  and  $c_2$  can be easily found by evaluating the distance between the parallel lines:

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

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

$$(4 \ 3)\mathbf{x} = 12 \pm \left\| \begin{pmatrix} 3 & 4 \end{pmatrix} \right\| 4 \quad (2.0.4)$$

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

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

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

$$(4 \ 3)\mathbf{x} = -8 \quad (2.0.7)$$

Finally the points on x-axis are:

$$\mathbf{x} = 8 \quad (2.0.8)$$

$$\mathbf{x} = -2 \quad (2.0.9)$$

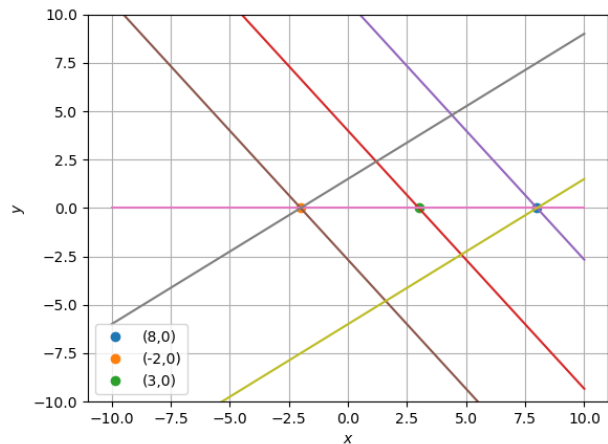


Fig. 0: Points on x-axis at a distance of 4 from the given line