

# 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:

$$(4 \ 3)\mathbf{x} = c1 \quad (2.0.1)$$

$$(4 \ 3)\mathbf{x} = c2 \quad (2.0.2)$$

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

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

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

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

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

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

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

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

Finally the points on x-axis are:

$$\mathbf{x} = 8$$

and

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

PLOT:

