Assignment 1

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1 QUESTION No. 34

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

$$\begin{pmatrix} 4 & 3 \end{pmatrix} \mathbf{x} = 12 \tag{1.0.1}$$

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 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:

$$\begin{pmatrix} 4 & 3 \end{pmatrix} \mathbf{x} = \mathbf{c_1} \tag{2.0.1}$$

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

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

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

$$c = 12 \pm 20 \tag{2.0.4}$$

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

$$\begin{pmatrix} 4 & 3 \end{pmatrix} \mathbf{x} = 32 \tag{2.0.5}$$

$$\begin{pmatrix} 4 & 3 \end{pmatrix} \mathbf{x} = -8 \tag{2.0.6}$$

Finally the points on x-axis are:

$$\mathbf{x} = 8 \tag{2.0.7}$$
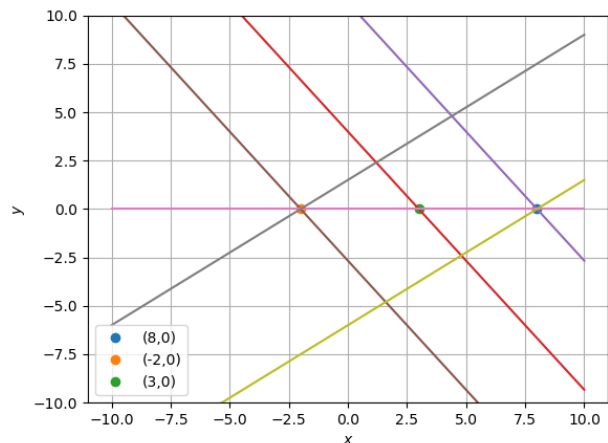
$$\mathbf{x} = -2 \tag{2.0.8}$$

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