4.3.47

EE25BTECH11057 - Rushil Shanmukha Srinivas

Problem: Find the equation of the line through (-2,3) with slope -4.
Solution: Given point is

$$\mathbf{h} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}, Slope = m = -4 \tag{0.1}$$

The equation of the line is given by

$$y = mx + c \tag{0.2}$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} x \\ mx + c \end{pmatrix} = \begin{pmatrix} 0 \\ c \end{pmatrix} + x \begin{pmatrix} 1 \\ m \end{pmatrix} \tag{0.3}$$

So

$$\mathbf{n}^\top \mathbf{x} = \mathbf{n}^\top \mathbf{h} = c \tag{0.4}$$

where $\mathbf{h}$ is any point on the line and $\mathbf{n} = \begin{pmatrix} -m \\ 1 \end{pmatrix}$

$$c = \mathbf{n}^\top \mathbf{h} = \begin{pmatrix} 4 & 1 \end{pmatrix} \begin{pmatrix} -2 \\ 3 \end{pmatrix} = -5 \tag{0.5}$$

so equation of line is

$$y = -4x - 5 \tag{0.6}$$

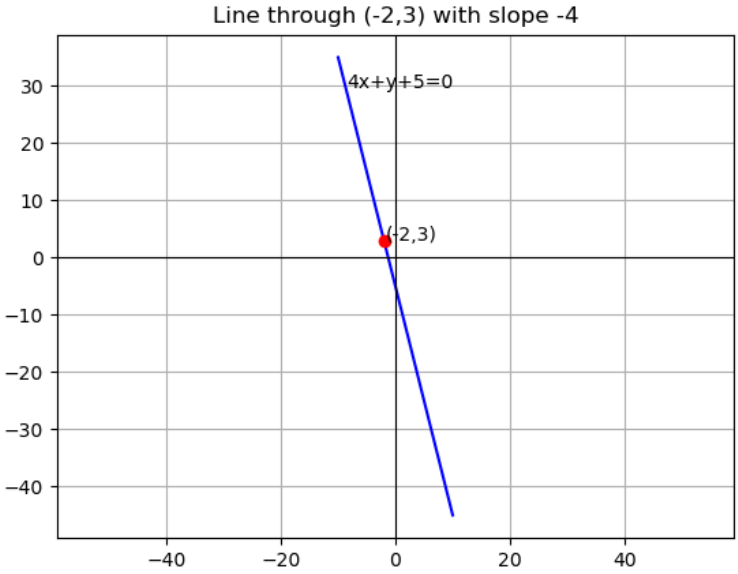

Fig: Representation of Line and Point