ASSIGNMENT 4

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- **Exercise:2.19:**

  Find the equation of the line parallel to the line

  $$\begin{pmatrix} 3 & -4 \end{pmatrix} x = 2$$

  and passing through the point

  $$\begin{pmatrix} -2 \\ 4 \end{pmatrix}$$

- **Solution:**

  Given,
  a line to which our line is parallel,

  $$\begin{pmatrix} 3 & -4 \end{pmatrix} x = 2$$

  and the point

  $$\begin{pmatrix} -2 \\ 4 \end{pmatrix}$$

  via which our line passes.

  Here, slope of our line and of given line will be equal or same.

  $\therefore \mathrm{m}_1 = m.$

  Here,

  $$n_1 = \begin{pmatrix} 3 \\ -4 \end{pmatrix}$$

and

$$m_1 = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$$

$Slope_1 = 3/4$

For the required line $slope = slope_1 = 3/4$

$$m = m_1 = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$$

and

$$n = n_1 = \begin{pmatrix} 3 \\ -4 \end{pmatrix}$$

$\therefore$ equation of required line is

$$X = A + \lambda_1 * m$$

$$X = \begin{pmatrix} -2 \\ 3 \end{pmatrix} + \lambda_1 \begin{pmatrix} 4 \\ 3 \end{pmatrix}$$

Or equation of required line is,

$$n^T(X - A) = 0$$

$$\begin{pmatrix} 3 & -4 \end{pmatrix} \left(X - \begin{pmatrix} -2 \\ 3 \end{pmatrix} \right) = 0$$

$$\begin{pmatrix} 3 & -4 \end{pmatrix}(X) + 6 + 12 = 0$$

$$\begin{pmatrix} 3 & -4 \end{pmatrix}(X) = -18$$

- **Exercise:2.21:**

  The hypotenuse of a right angled triangle has its ends at the points

  $$\begin{pmatrix} 1 \\ 3 \end{pmatrix}$$

  and

  $$\begin{pmatrix} -4 \\ 1 \end{pmatrix}$$

  Find an equation of the legs of the triangle.

- **Solution:**

  Given,
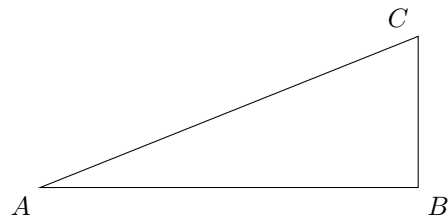 the end points of hypotenuse line

  $$\begin{pmatrix} 1 \\ 3 \end{pmatrix}$$

  and

  $$\begin{pmatrix} -4 \\ 1 \end{pmatrix}$$

  Assuming a particular condition, then the other vertex of the right angeled triangle will be

  $$\begin{pmatrix} 1 \\ 1 \end{pmatrix}$$

  i) For equation of AB(base)

  $$m = B - A$$

  $$m = \begin{pmatrix} 1 \\ 1 \end{pmatrix} - \begin{pmatrix} -4 \\ 1 \end{pmatrix} = \begin{pmatrix} 4 \\ 0 \end{pmatrix}$$

$$n = \begin{pmatrix} 0 \\ 4 \end{pmatrix}$$

For equation,

$$n^T(X - A) = 0$$

$$\begin{pmatrix} 0 & 4 \end{pmatrix}\left(X - \begin{pmatrix} 1 \\ 1 \end{pmatrix}\right) = 0$$

$$\begin{pmatrix} 0 & 4 \end{pmatrix}(X) - 4 = 0$$

$$\begin{pmatrix} 0 & 4 \end{pmatrix}(X) = 4$$

ii) For equation of BC(altitude)

$$m = C\text{-}B$$

$$m = \begin{pmatrix} 1 \\ 3 \end{pmatrix} - \begin{pmatrix} 1 \\ 1 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$$

$$n = \begin{pmatrix} -2 \\ 0 \end{pmatrix}$$

For equation,

$$n^T(X - B) = 0$$

$$\begin{pmatrix} -2 & 0 \end{pmatrix}\left(X - \begin{pmatrix} 1 \\ 1 \end{pmatrix}\right) = 0$$

$$\begin{pmatrix} -2 & 0 \end{pmatrix}(X) + 2 = 0$$

$$\begin{pmatrix} -2 & 0 \end{pmatrix}(X) = -2$$