Matgeo Presentation - Problem 12.277

ee25btech11056 - Suraj.N

October 1, 2025

Problem Statement

Two points $(4, p)$ and $(0, q)$ lie on a straight line having a slope of $3/4$. Find the value of $p - q$.

Data

Points	Value
A	$\begin{pmatrix} 4 \\ p \end{pmatrix}$
B	$\begin{pmatrix} 0 \\ q \end{pmatrix}$

Table : Points

Solution

Let the equation of the line be

$$\mathbf{n}^\top \mathbf{x} = 1 \tag{0.1}$$

A and **B** lie on the Line

$$\mathbf{n}^\top \mathbf{A} = 1 \tag{0.2}$$

$$\mathbf{n}^\top \mathbf{B} = 1 \tag{0.3}$$

Stacking gives

$$\begin{pmatrix} \mathbf{A} & \mathbf{B} \end{pmatrix}^\top \mathbf{n} = \begin{pmatrix} 1 \\ 1 \end{pmatrix} \tag{0.4}$$

$$\begin{pmatrix} 4 & p \\ 0 & q \end{pmatrix} \mathbf{n} = \begin{pmatrix} 1 \\ 1 \end{pmatrix} \tag{0.5}$$

Solution

Using back substitution we get **n** as

$$\mathbf{n} = \begin{pmatrix} \frac{q-p}{4q} \\ \frac{1}{q} \end{pmatrix} = \begin{pmatrix} \frac{q-p}{4} \\ 1 \end{pmatrix} \tag{0.6}$$

As the value of the slope of line is given in the question , we can write the normal vector as :

$$\mathbf{n} = \begin{pmatrix} -\frac{3}{4} \\ 1 \end{pmatrix} = \begin{pmatrix} \frac{q-p}{4} \\ 1 \end{pmatrix} \tag{0.7}$$

From the above equation we get :

$$p - q = 3 \tag{0.8}$$

Answer: $p - q = 3$

Plot

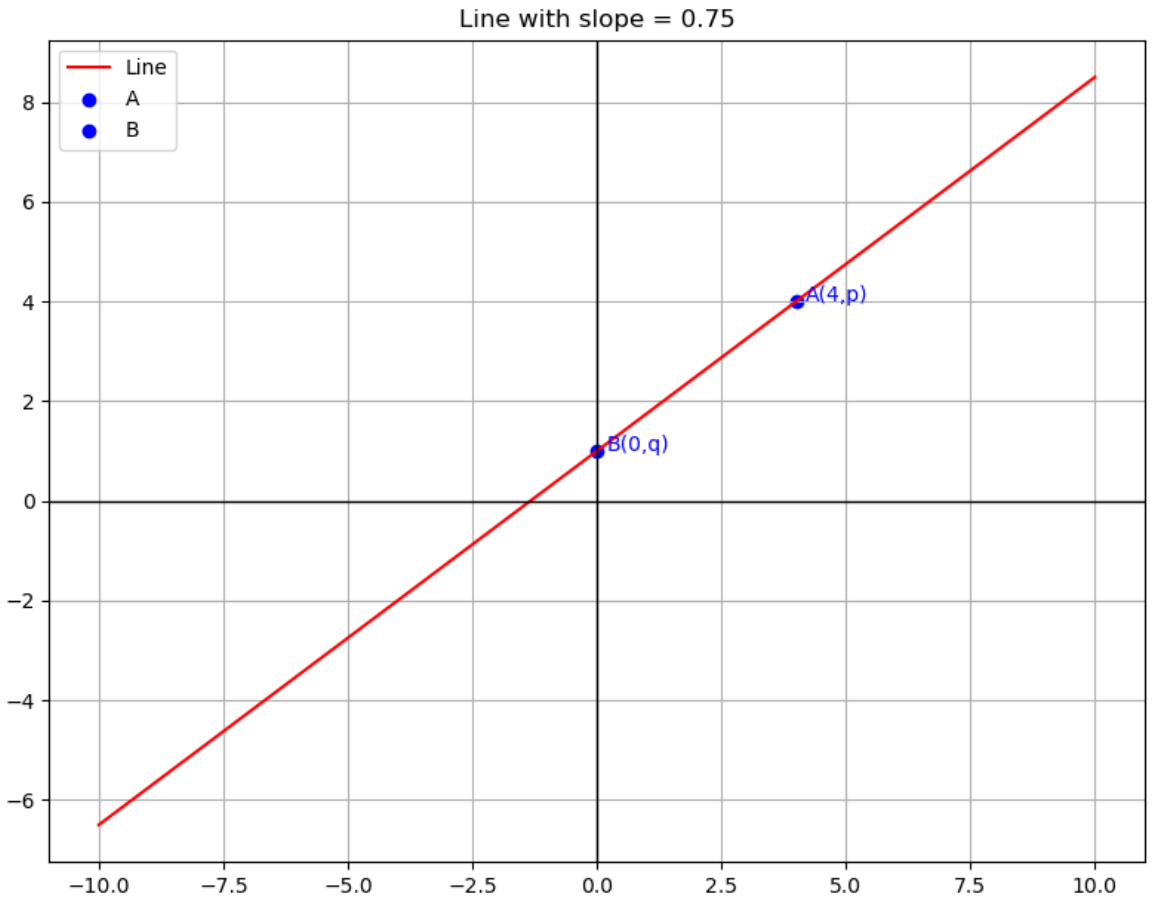

Fig : Line