4.2.8

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Question

Find the direction and normal vectors of the line $5 = 2x$.

Solution

The equation of the line can be written as

$$2x - 5 = 0 \tag{1}$$

The slope of the line $x = \frac{5}{2}$ is undefined, therefore it can be expressed in the parametric form as:

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} \frac{5}{2} \\ 0 \end{pmatrix} + \lambda \begin{pmatrix} 0 \\ 1 \end{pmatrix} \tag{2}$$

Solution

Let $\begin{pmatrix} x \\ y \end{pmatrix}$ be the normal vector. Therefore

$$\begin{pmatrix} x \\ y \end{pmatrix}^T \begin{pmatrix} 0 \\ 1 \end{pmatrix} = 0 \tag{3}$$

$$y = 0 \tag{4}$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \end{pmatrix} \tag{5}$$

Solution

Therefore the line can be expressed as

$$\begin{pmatrix} 1 \\ 0 \end{pmatrix}^T x = \frac{5}{2} \tag{6}$$

Therefore, the direction vector is $\begin{pmatrix} 0 \\ 1 \end{pmatrix}$, and the normal vector is $\begin{pmatrix} 1 \\ 0 \end{pmatrix}$.

Plot

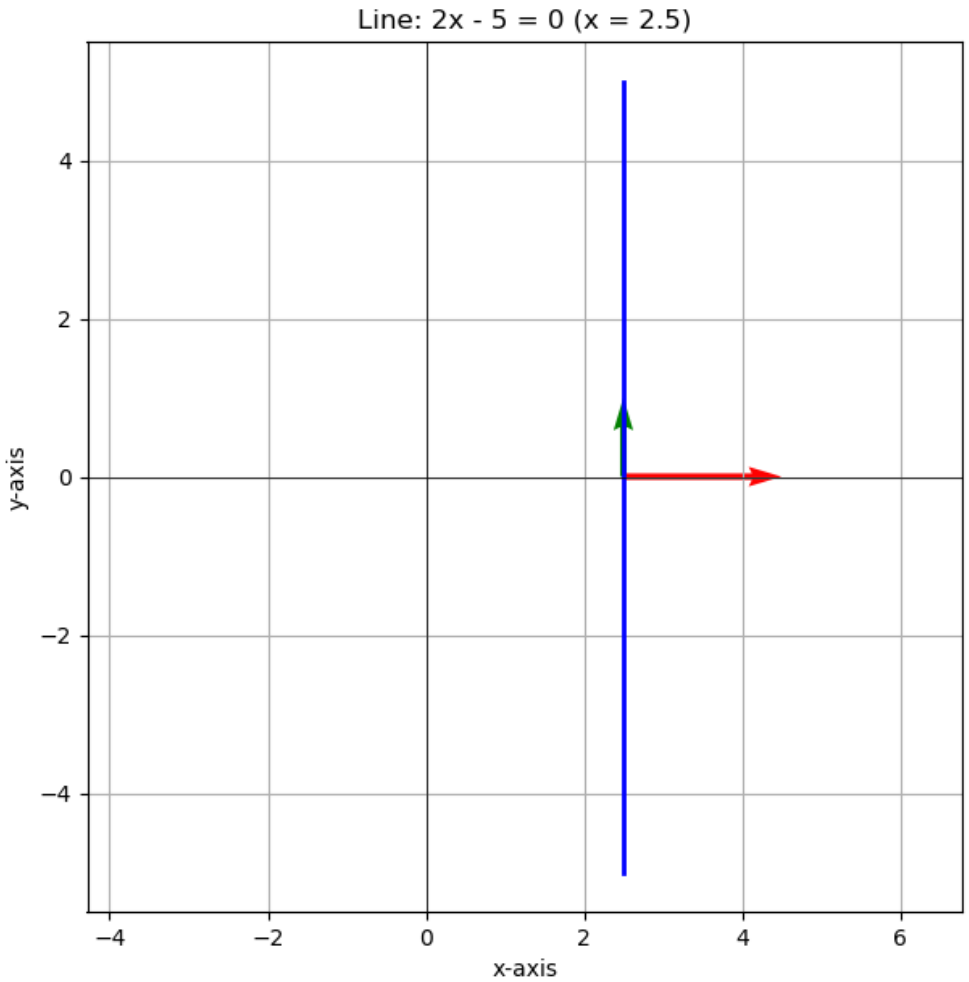

Figure: Plot of the line $x = 2.5$

Code Repository

The codes for this problem can be found at:

`https://github.com/Aditya-Mishra11005/ee1030-2025/tree/main/ee25btech11005/matgeo/4.2.8/Codes`