

## 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

$$2x - 5 = 0 \quad (1)$$

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

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

# Solution

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

$$\begin{pmatrix} x \\ y \end{pmatrix}^T \begin{pmatrix} 0 \\ 1 \end{pmatrix} = 0 \quad (3)$$

$$y = 0 \quad (4)$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad (5)$$

# Solution

Therefore the line can be expressed as

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

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

# Plot

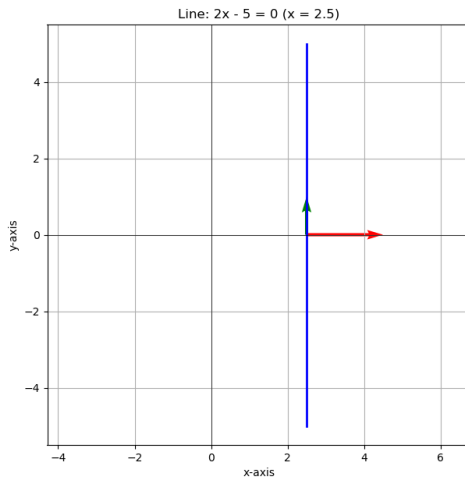


Figure: Plot of the line  $x = 2.5$

The codes for this problem can be found at:

<https://github.com/YourUsername/YourRepo>