4-4.2-21

AI24BTECH11016-Jakkula Adishesh Balaji

Linear Forms (Parameters)

Question:
4.2.21 Find the direction and normal vectors of the line $F = \frac{9}{5}C + 32$.
Solution:

Parameter	Description
$\vec{m}$	Direction vector
$\vec{n}$	Normal vector
$\vec{h}$	Intercept vector
$\vec{x}$	Vector which represents points on the line

TABLE .1
Parameters Used

The direction vector can be found as follows:
The equation of the line is given by

$$F = \frac{9}{5}C + 32 \tag{.1}$$

$$\implies \begin{pmatrix} C \\ F \end{pmatrix} = \begin{pmatrix} C \\ \frac{9}{5}C + 32 \end{pmatrix} = C\begin{pmatrix} 1 \\ \frac{9}{5} \end{pmatrix} + \begin{pmatrix} 0 \\ 32 \end{pmatrix} \tag{.2}$$

yielding

$$\vec{x} = \vec{h} + k\vec{m}$$

where $\vec{h}$ is any point on the line and

$$\vec{m} = \begin{pmatrix} 1 \\ \frac{9}{5} \end{pmatrix}$$

The normal vector can be found as follows:

$$\vec{m}^T\vec{n} = 0 \tag{.3}$$

$$\vec{n}^T\vec{x} = \vec{n}^T\vec{h} + k\vec{n}^T\vec{m} \tag{.4}$$

$$\vec{n} = \begin{pmatrix} -\frac{9}{5} \\ 1 \end{pmatrix} \tag{.5}$$

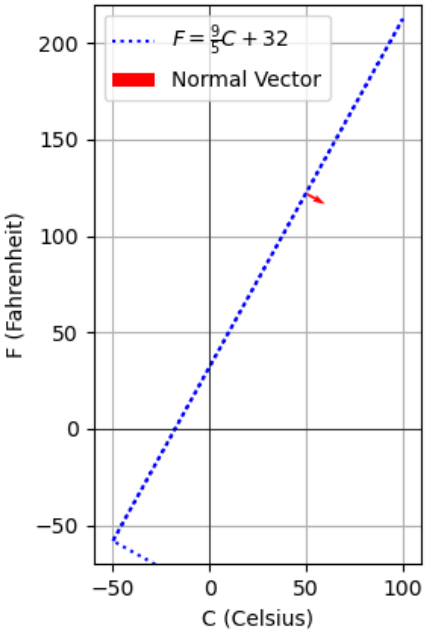

Fig. .1. Graphical representation of the vectors.