

4-4.2-21

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LINEAR FORMS (PARAMETERS)

Question:

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

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

TABLE 0
VARIABLES USED

The normal vector can be found as follows:

$$F - \frac{9}{5}C = 32 \quad (0.1)$$

$$\begin{pmatrix} 1 & -\frac{9}{5} \end{pmatrix} \begin{pmatrix} F \\ C \end{pmatrix} = \begin{pmatrix} 32 \\ 0 \end{pmatrix} \quad (0.2)$$

$$\begin{pmatrix} 1 & -\frac{9}{5} \end{pmatrix} x = 32 \quad (0.3)$$

$$\vec{n}^T \vec{x} = 32 \quad (0.4)$$

$$\vec{n} = \begin{pmatrix} 1 \\ -\frac{9}{5} \end{pmatrix} \quad (0.5)$$

The direction vector can be found as follows:

$$F = F \quad (0.6)$$

$$C = \frac{5}{9}F - \frac{160}{9} \quad (0.7)$$

$$\begin{pmatrix} F \\ C \end{pmatrix} = F \begin{pmatrix} 1 \\ \frac{5}{9} \end{pmatrix} + \begin{pmatrix} 0 \\ -\frac{160}{9} \end{pmatrix} \quad (0.8)$$

$$\vec{x} = k\vec{m} + \vec{h} \quad (0.9)$$

$$\vec{m} = \begin{pmatrix} 1 \\ \frac{5}{9} \end{pmatrix} \quad (0.10)$$

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

Normal vector: $\vec{n} = \begin{pmatrix} 1 \\ -\frac{9}{5} \end{pmatrix}$

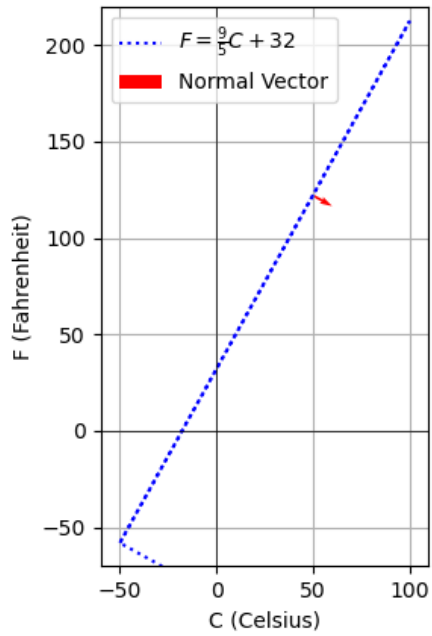


Fig. 0.1. Graphical representation of the vectors.