

Matgeo: 4-4.2-21

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1 Problem

2 Solution

- Direction Vector
- Normal Vector

Problem Statement

Find the direction and normal vectors of the line.

$$F = \frac{9}{5}C + 32 \quad (3.1)$$

Direction Vector

The equation of line is given by

$$\begin{pmatrix} C \\ F \end{pmatrix} = \begin{pmatrix} C \\ \frac{9}{5}C + 32 \end{pmatrix} + \begin{pmatrix} 0 \\ 32 \end{pmatrix} \quad (3.2)$$

which can be compared with

$$\mathbf{x} = \mathbf{h} + k\mathbf{m} \quad (3.3)$$

Where \mathbf{h} is any point on the line and

$$\mathbf{m} = \begin{pmatrix} 1 \\ \frac{9}{5} \end{pmatrix} \quad (3.4)$$

is the direction vector

Normal Vector

The normal vector can be found as follows

$$\mathbf{m}^T \mathbf{n} = 0 \quad (3.5)$$

$$\mathbf{n}^T \mathbf{x} = \mathbf{n}^T \mathbf{h} + k \mathbf{n}^T \mathbf{m} \quad (3.6)$$

$$\mathbf{n} = \begin{pmatrix} -m \\ 1 \end{pmatrix} \quad (3.7)$$

Hence, the normal vector

$$\mathbf{n} = \begin{pmatrix} -\frac{9}{5} \\ 1 \end{pmatrix} \quad (3.8)$$

The code in `/bmrasgn/asgn1/codes/line.py` verifies (3.4) and (3.8)