Assignment1

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Abstract—This document illustrates the distance of the point from the point of intersection of the line and the plain.

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1 PROBLEM

Find θ and P if $\begin{pmatrix} \sqrt{3} & 1 \end{pmatrix} \mathbf{x} = -2$ is equivalent to $(\cos\theta \quad \sin\theta)\mathbf{x} = \mathrm{p}$?

2 SOLUTION

The given equation of line is,

$$\mathbf{n}^T \mathbf{x} = c \qquad (2.0.1)$$

where $\mathbf{n} = \begin{pmatrix} \sqrt{3} & 1 \end{pmatrix}$ and $c = -2$
Now obtain a new equation,

$$\frac{\mathbf{n}}{\|\mathbf{n}\|}\mathbf{x} = \frac{c}{\|\mathbf{n}\|}; \qquad (2.0.2)$$

where $\|\mathbf{n}\|$ is the norm of the $\mathbf{n} \implies$

$$\mathbf{u}^T \mathbf{x} = P \qquad (2.0.3)$$

where $\mathbf{u} = \begin{pmatrix} \cos\theta \\ \sin\theta \end{pmatrix}$ and $P = \frac{c}{\|\mathbf{n}\|}$
Substituting the values of $\mathbf{n}$ and c, we get

$$\|\mathbf{n}\| = 2 \qquad (2.0.4)$$

$$\begin{pmatrix} \sqrt{3}/2 & 1/2 \end{pmatrix} \mathbf{x} = -1 \qquad (2.0.5)$$

$$\begin{pmatrix} -\sqrt{3}/2 & -1/2 \end{pmatrix} \mathbf{x} = 1 \qquad (2.0.6)$$

From (2.0.3) and (2.0.6). we derive,

$$\cos\theta = -\sqrt{3}/2 \ ; \quad \sin\theta = -1/2 \qquad (2.0.7)$$

$$P = 1 \qquad (2.0.8)$$

$$\therefore \quad \theta = \cos^{-1}(\frac{-\sqrt{3}}{2}) = \sin^{-1}(\frac{-1}{2}) = 210 \ , \quad P = 1 \qquad (2.0.9)$$