4.7.56

EE25BTECH11059 - Vaishnavi Ramkrishna Anantheertha

Question: Find the equation of the line whose perpendicular distance from the origin is 4 units and the angle which the normal makes with positive direction of x-axis is 15°

Solution 1:

Variable	Value
d	4
m	$-cot15°$

TABLE 0: Variables Used

Let eq of line be

$$\mathbf{n^T x} = c \tag{0.1}$$

where,

$$\mathbf{n} = \begin{pmatrix} cos15° \\ sin15° \end{pmatrix} \tag{0.2}$$

eq of line is

$$\begin{pmatrix} cos15° & sin15° \end{pmatrix} \mathbf{x} = c \tag{0.3}$$

$$\tag{0.4}$$

As distance from origin (d)=4 units

$$\frac{|c|}{||n||} = 4 \tag{0.5}$$

$$\frac{|c|}{1} = 4 \tag{0.6}$$

$$c = \pm 4 \tag{0.7}$$

Hence eq of line is

$$\begin{pmatrix} cos15° & sin15° \end{pmatrix} \mathbf{x} = \pm 4 \tag{0.8}$$

Refer to Figure

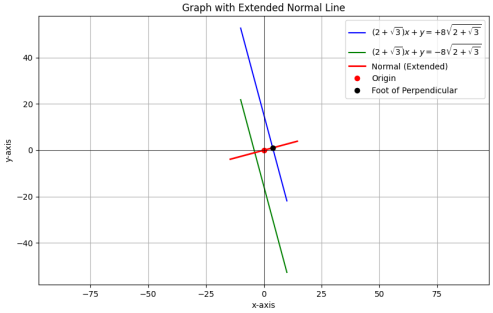
Graph with Extended Normal Line
$(2+\sqrt{3})x+y=+8\sqrt{2+\sqrt{3}}$
$(2+\sqrt{3})x+y=-8\sqrt{2+\sqrt{3}}$
Normal (Extended)
Origin
Foot of Perpendicular
y-axis
x-axis
40
20
0
−20
−40
−75
−50
−25
0
25
50
75

Fig. 0.1