

Name: YADATI KRISHNA

Assignment-4

Roll No. : FWC22036

Problem Statement:

Slope of a line passing through P(2,3) and intersecting the line $x+y=7$ at a distance of 4 units from P .

$$d^2 = \|\mathbf{P} - \mathbf{Q}\|^2 \quad (6)$$

The parametric equation of line

$$\mathbf{Q} = \mathbf{A} + \lambda \mathbf{m} \quad (7)$$

Substituting (7) in (6) we get

$$d^2 = \|\mathbf{P} - \mathbf{A} - \lambda \mathbf{m}\|^2 \quad (8)$$

$$\mathbf{n}^\top \mathbf{x} = \mathbf{c} \quad (1)$$

$$d^2 = \lambda^2 \|\mathbf{m}\|^2 - 2\lambda \mathbf{m}^\top (\mathbf{P} - \mathbf{A}) + \|\mathbf{P} - \mathbf{A}\|^2 \quad (9)$$

$$\mathbf{P} = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \quad (2) \quad \lambda^2 \|\mathbf{m}\|^2 - 2\lambda \mathbf{m}^\top (\mathbf{P} - \mathbf{A}) + \|\mathbf{P} - \mathbf{A}\|^2 - d^2 = 0 \quad (10)$$

$$d = 4 \quad (3) \quad \lambda = \frac{-\mathbf{m}^\top (\mathbf{P} - \mathbf{A}) \pm \sqrt{(\mathbf{m}^\top (\mathbf{P} - \mathbf{A}))^2 - \|\mathbf{m}\|^2 (\|\mathbf{P} - \mathbf{A}\|^2 - d^2)}}{\|\mathbf{m}\|^2} \quad (11)$$

To Find

Slope of the line passing through \mathbf{P}

Let \mathbf{A} be the point on the given line then

$$(\mathbf{V}\mathbf{q} + \mathbf{u})^\top \mathbf{X} + \mathbf{u}^\top \mathbf{q} + \mathbf{f} = 0 \quad (12)$$

STEP-1

From given, we know that point \mathbf{P}

$$(1 \ 1) \mathbf{A} = 7 \quad (13)$$

Let \mathbf{Q} be the intersection point

from given line equation we can conclude that it is intersecting X-axis at point (7,0) so,

$$\mathbf{Q} = \begin{pmatrix} x \\ y \end{pmatrix} \quad (4) \quad \mathbf{A} = \begin{pmatrix} 7 \\ 0 \end{pmatrix} \quad (14)$$

on substituting $\mathbf{P}, \mathbf{A}, \mathbf{m}$ and d in (11)

STEP-3

Solving (11) we get $\lambda = -1.36, -6.64$

substituting λ, \mathbf{A} and \mathbf{m} in (7) we get

STEP-2

The distance from a point \mathbf{P} to \mathbf{Q} is given by,

$$\mathbf{Q}_1 = \begin{pmatrix} 0.36 \\ 6.64 \end{pmatrix} \quad (15)$$

$$d = \|\mathbf{P} - \mathbf{Q}\| \quad (5)$$

$$\mathbf{Q}_2 = \begin{pmatrix} 5.64 \\ 1.36 \end{pmatrix} \quad (16)$$

Squaring on both the sides

The directional vectors of line joining two points is given by

$$\mathbf{m} = \mathbf{P} - \mathbf{Q}_1 \quad (17)$$

$$\mathbf{m}_1 = \mathbf{P} - \mathbf{Q}_2 \quad (18)$$

The directional vector is given by

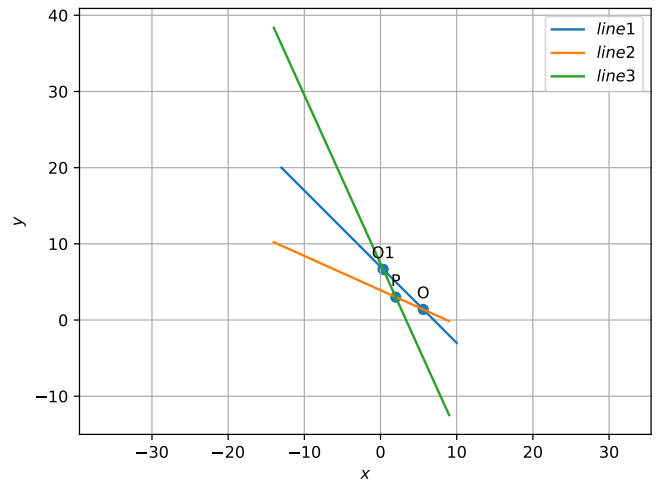
$$\mathbf{m} = \begin{pmatrix} 1 \\ m \end{pmatrix} \quad (19)$$

by solving (17), we get the slope of the line

$$m = -2.21$$

Similarly, by solving (18), we get the slope of the line

$$m = -0.45$$



Construction

vertex	coordinates
P	$\begin{pmatrix} 2 \\ 3 \end{pmatrix}$
d	4

Download the code

Github link: [Assignment-4](#).