

Assignment 2

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Download all python codes from

<https://github.com/TGURUBALAJI/INTERNSHIP-IITH/Assignment2/code>

and latex-tikz codes from

<https://github.com/TGURUBALAJI/INTERNSHIP-IITH/Assignment2/gbalaji.tex>

1 QUESTION No. 2.106 - LINEAR FORMS

Find the values of k for which the line

$$(k - 3 - (4 - k^2))\mathbf{x} + k^2 - 7k + 6 = 0 \quad (1.0.1)$$

is

- a) Parallel to the x-axis
- b) Parallel to the y-axis
- c) Passing through the origin

2 SOLUTION

Given equation of the line,

$$(k - 3 - (4 - k^2))\mathbf{x} + k^2 - 7k + 6 = 0 \quad (2.0.1)$$

2.1 Parallel to x-axis

Equation of x-axis is $(1 \ 0)\mathbf{x} = 0$

$$(1 \ 0)\begin{pmatrix} k - 3 \\ -(4 - k^2) \end{pmatrix} = 0 \quad (2.1.1)$$

$$k - 3 = 0 \quad (2.1.2)$$

$$k = 3 \quad (2.1.3)$$

Substituting $k = 3$ in (2.0.1)

Equation of line is,

$$(0 \ 5)\mathbf{x} = 6 \quad (2.1.4)$$

2.2 Parallel to y-axis

Equation of y-axis is $(0 \ 1)\mathbf{x} = 0$

$$(0 \ 1)\begin{pmatrix} k - 3 \\ -(4 - k^2) \end{pmatrix} = 0 \quad (2.2.1)$$

$$4 - k^2 = 0 \quad (2.2.2)$$

$$k = \pm 2 \quad (2.2.3)$$

Substituting $k = 2$ in (2.0.1)

Equation of line is,

$$(-1 \ 0)\mathbf{x} = 12 \quad (2.2.4)$$

Substituting $k = -2$ in (2.0.1)

Equation of line is,

$$(-5 \ 0)\mathbf{x} = -16 \quad (2.2.5)$$

2.3 passing through origin

Equation of line when passing through origin is

$$\mathbf{n}^T \mathbf{x} = 0 \quad (2.3.1)$$

Hence

$$-k^2 + 7k - 6 = 0 \quad (2.3.2)$$

$$(k - 1)(k - 6) = 0 \quad (2.3.3)$$

$$k = 1, k = 6 \quad (2.3.4)$$

Substituting $k = 1$ in (2.0.1)

The equation of line is,

$$(-2 \ -3)\mathbf{x} = 0 \quad (2.3.5)$$

Substituting $k = 6$ in (2.0.1)

The equation of line is,

$$(3 \ 32)\mathbf{x} = 0 \quad (2.3.6)$$

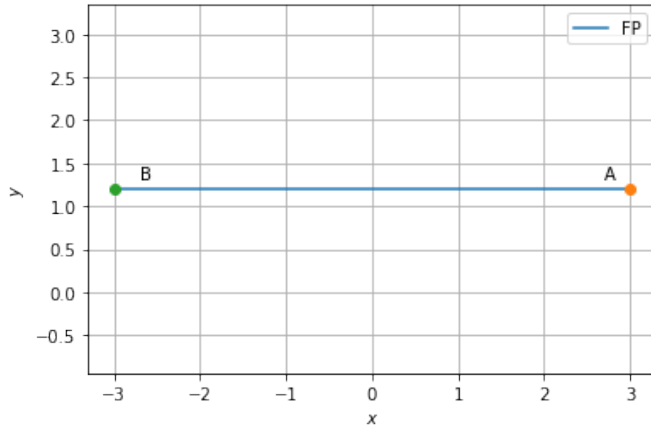


Fig. 0: a) Plot of line parallel to x-axis

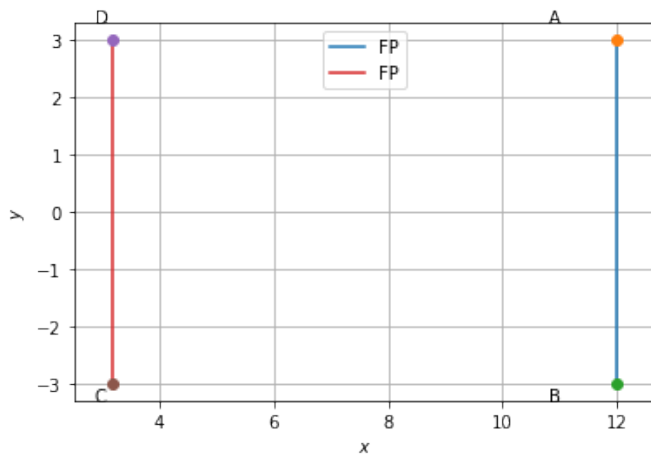


Fig. 0: b) Plot of line parallel to y-axis

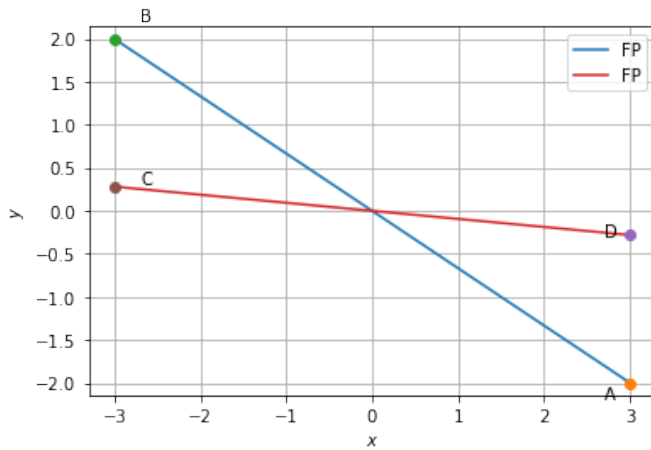


Fig. 0: c) Plot of line passing through origin