

# 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>

Equation of x-axis is

$$\begin{aligned} (1 \ 0) \mathbf{x} &= 0 \\ (1 \ 0) \begin{pmatrix} k-3 \\ -(4-k^2) \end{pmatrix} &= 0 \\ k-3 &= 0 \\ \implies k &= 3 \end{aligned} \quad (7)$$

Substituting  $k = 3$  in (2)

Equation of line is,

$$(0 \ 5) \mathbf{x} = 6 \quad (8)$$

b) Parallel to y-axis

$$\mathbf{n} = (1 \ 0) \quad (9)$$

if the line is parallel to y-axis

Equation of y-axis is

$$\begin{aligned} (0 \ 1) \mathbf{x} &= 0 \\ (0 \ 1) \begin{pmatrix} k-3 \\ -(4-k^2) \end{pmatrix} &= 0 \\ 4-k^2 &= 0 \\ \implies k &= \pm 2 \end{aligned} \quad (10)$$

Substituting  $k = 2$  in (2). Equation of line is,

$$(-1 \ 0) \mathbf{x} = 4 \quad (11)$$

Substituting  $k = -2$  in (2). Equation of line is,

$$(-5 \ 0) \mathbf{x} = -24 \quad (12)$$

c) Passing through origin

$c = 0$  if the line passes through origin

Equation of line when passing through origin is

$$\mathbf{n}^T \mathbf{x} = 0 \quad (13)$$

## 1 QUESTION No. 2.106 - LINEAR FORMS

**2.106** Find the values of  $k$  for which the line

$$(k-3 \ -(4-k^2)) \mathbf{x} + k^2 - 7k + 6 = 0 \quad (1)$$

is

a) Parallel to the x-axis

b) Parallel to the y-axis

c) Passing through the origin

**Solution** Given equation of the line,

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

of a general line equation

$$\mathbf{n} \mathbf{x} = c \quad (3)$$

here

$$\mathbf{n} = (k-3 \ -(4-k^2)) \quad (4)$$

and

$$c = -k^2 + 7k - 6 \quad (5)$$

a) Parallel to x-axis

$$\mathbf{n} = (0 \ 1) \quad (6)$$

if the line is parallel to x-axis

Hence

$$\begin{aligned}
 -k^2 + 7k - 6 &= 0 \\
 &= -k^2 + k + 6k - 6 \\
 &= (k - 1)(k - 6) \\
 \Rightarrow k &= 1, k = 6
 \end{aligned} \tag{14}$$

Substituting  $k = 1$  in (2). The equation of line is,

$$(-2 \ -3)\mathbf{x} = 0 \tag{15}$$

Substituting  $k = 6$  in (2). The equation of line is,

$$(3 \ 32)\mathbf{x} = 0 \tag{16}$$

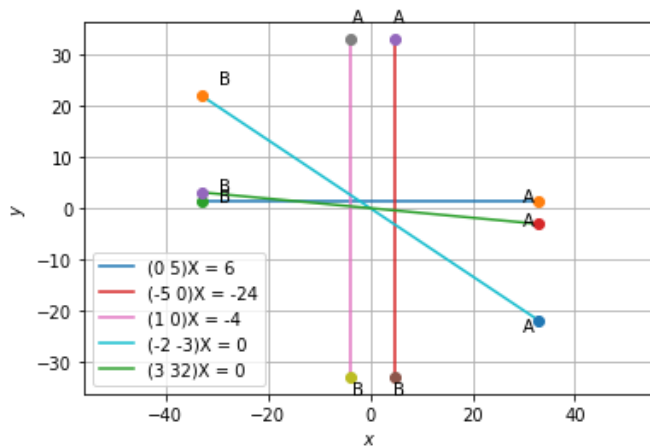


Fig. 3: Plot of line equations