#### 1

# **ASSIGNMENT 5**

## Atla keerthana

# Download all python codes from

https://github.com/Atlakeerthana/Assignment5/tree/main/Assignment5

## and latex-tikz codes from

https://github.com/Atlakeerthana/Assignment5/tree/main/Assignment5

## 1 Question No 2.23(Quad forms)

Find the roots of the following quadratic equations, if they exist.

1)

$$3x^2 - 5x + 2 = 0 \tag{1.0.1}$$

2)

$$x^2 + 4x + 5 = 0 \tag{1.0.2}$$

#### 2 SOLUTION

1) The vector form of

$$y = 3x^2 - 5x + 2 \tag{2.0.1}$$

is

$$\mathbf{x}^T \begin{pmatrix} 3 & 0 \\ 0 & 0 \end{pmatrix} \mathbf{x} + \begin{pmatrix} -5 & 0 \end{pmatrix} \mathbf{x} + 2 = 0 \qquad (2.0.2)$$

Thus

$$y = 0 \implies 3x^2 - 5x + 2 = 0$$
 (2.0.3)

Compare given quadratic equation  $3x^2-5x+2 = 0$  with  $ax^2 + bx + c = 0$ , we get

$$a = 3, b = -5, c = 2$$
 (2.0.4)

so,

$$b^2 - 4ac = (-5)^2 - 4(3)(2) (2.0.5)$$

$$= 25 - 24 = 1 > 0$$
 (2.0.6)

Since the square of a real number is positive.

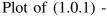
$$(x-1)(3x-2) = 0$$
 (2.0.7)

$$x_1 = 1, x_2 = \frac{2}{3}$$
 (2.0.8)

The roots are 1 and 0.66

$$x_1 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}, x_2 = \begin{pmatrix} 0.66 \\ 0 \end{pmatrix}$$
 (2.0.9)

which can be verified from the fig(1.0.1) generated by following python code.



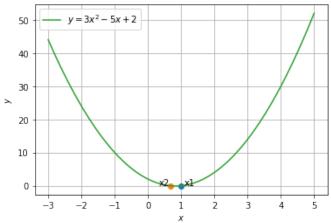


Fig. 2.1: roots of  $3x^2 - 5x + 2$ .

2) The vector form of

$$y = x^2 + 4x + 5 \tag{2.0.10}$$

is

$$\mathbf{x}^T \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix} \mathbf{x} + \begin{pmatrix} 4 & 0 \end{pmatrix} \mathbf{x} + 5 = 0 \qquad (2.0.11)$$

Thus

$$y = 0 \implies x^2 + 4x + 5 = 0$$
 (2.0.12)

Compare given quadratic equation  $x^2+4x+5=0$  with  $ax^2+bx+c=0$ , we get

$$a = 1, b = 4, c = 5$$
 (2.0.13)

so,

$$b^2 - 4ac = (4)^2 - 4(1)(5) (2.0.14)$$

$$= 16 - 20 = -4 < 0 \tag{2.0.15}$$

Since the square of a real number cannot be negative.so there are no real roots for the given equation.

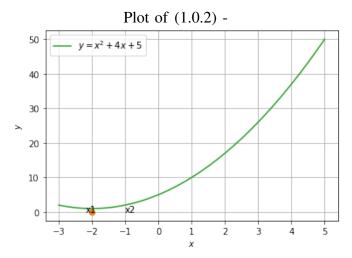


Fig. 2.2: roots of  $x^2 + 4x + 5$ .