ASSIGNMENT 5

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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

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

Thus

$$y = 0 \implies 3x^2 - 5x + 2 = 0 \tag{2.0.3}$$

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

$$a = 3, b = -5, c = 2 \tag{2.0.4}$$

so,

$$b^2 - 4ac = (-5)^2 - 4(3)(2) \tag{2.0.5}$$

$$= 25 - 24 = 1 > 0 \tag{2.0.6}$$

Since the square of a real number is positive.

$$(x - 1)(3x - 2) = 0 \tag{2.0.7}$$

$$x = 1, \frac{2}{3} \tag{2.0.8}$$

The roots are 1 and 0.66

$$x = \begin{pmatrix} 1 \\ 0 \end{pmatrix}, \begin{pmatrix} 0.66 \\ 0 \end{pmatrix} \tag{2.0.9}$$

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

Plot of (1.0.1) -

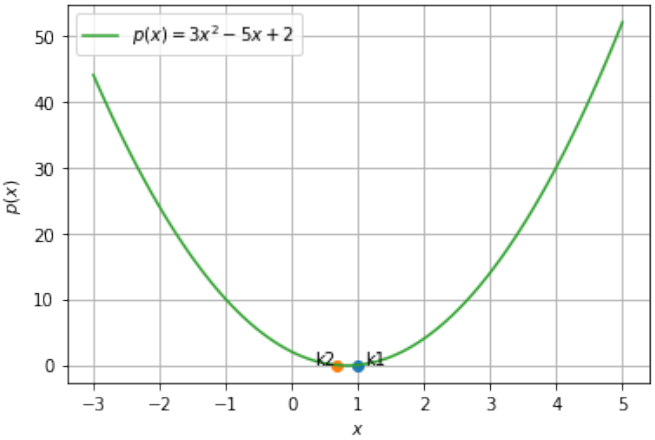

Fig. 2.1: roots of $3x^2 - 5x + 2$.

2) The vector form of

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

is

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

Thus

$$y = 0 \implies x^2 + 4x + 5 = 0 \tag{2.0.12}$$

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

$$a = 1, b = 4, c = 5 \tag{2.0.13}$$

so,

$$b^2 - 4ac = (4)^2 - 4(1)(5) \tag{2.0.14}$$

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

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

equation.