ASSIGNMENT-4

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Download all python codes from

https://github.com/behappy0604/Summer−Internship−IITH/tree/main/Assignment−4

and latex-tikz codes from

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1 Question No. 2.43 (a)

Find the roots of the equation: $x+\frac{1}{x} = 3$, $x \neq 0$

2 Solution

1) The given equation can be writen as:

$$x^2 + 1 = 3x \tag{2.0.1}$$

$$x^2 - 3x + 1 = 0 \tag{2.0.2}$$

2) The vector form of the equation is:

$$\mathbf{x}^T \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix} \mathbf{x} + \begin{pmatrix} -3 & 0 \end{pmatrix} \mathbf{x} - 1 = 0 \tag{2.0.3}$$

3) Comparing (2.0.2) with standard quadractic equation $ax^2 + bx + 1 = 0$ we get:

$$a = 1 \tag{2.0.4}$$

$$b = -3 \tag{2.0.5}$$

$$c = 1 \tag{2.0.6}$$

4) The discriminant is:

$$D = b^2 - 4ac \tag{2.0.7}$$

$$D = 5 \tag{2.0.8}$$

Thus the equation has real roots.

5) We know that:

$$x = \frac{\sqrt{-b \pm D}}{4a} \tag{2.0.9}$$

Putting the values we get

$$\mathbf{x} = \begin{pmatrix} 2.6180 \\ 0 \end{pmatrix}, \begin{pmatrix} 0,38196 \\ 0 \end{pmatrix} \tag{2.0.10}$$

6) The values of $\mathbf{x}$ are found in the python code. The plot of the quadratic equation is:

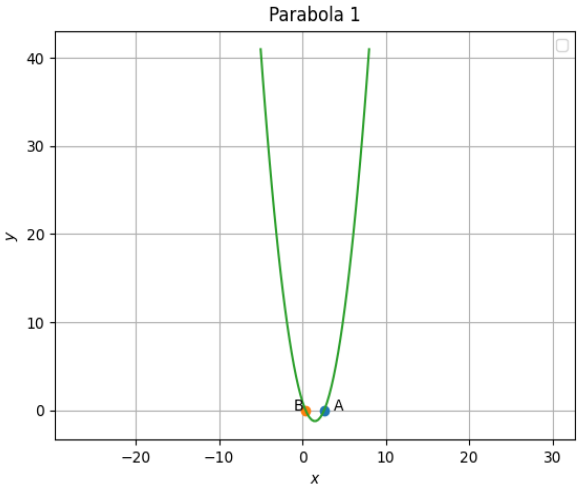

Fig. 2.1: curve