Assignment 1

Hima M

Find Python Codes from below link

https://github.com/HimaMadhu/internship/blob/main/Assignment1/Assignment1.py

and latex-tikz codes from

https://github.com/HimaMadhu/internship/blob/main/assignment1/assignment%201.tex

1 Examples 1

Question 9

Find the value of x_1 if the distance between the points $(x_1, 2)$ and $(3, 4)$ be 8

$$\begin{pmatrix} x_1 \\ 2 \end{pmatrix}, \begin{pmatrix} 3 \\ 4 \end{pmatrix} \tag{1.0.1}$$

1.1 Solution

The distance between two vectors is given by

$$\|\mathbf{A}-\mathbf{B}\| = \sqrt{\left(\mathbf{A}-\mathbf{B}\right)^{\mathsf{T}}\left(\mathbf{A}-\mathbf{B}\right)} \tag{1.1.1}$$

Let

$$\mathbf{A} = \begin{pmatrix} x_1 \\ 2 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$$

(1.1.2)

$$\mathbf{A}-\mathbf{B} = \begin{pmatrix} x_1 - 3 \\ -2 \end{pmatrix} \tag{1.1.3}$$

Given the distance between $\mathbf{A}$ and $\mathbf{B}$ is 8

From (1.1.1) (1.0.1)

$$\left\| \begin{pmatrix} x_1 - 3 \\ -2 \end{pmatrix} \right\| = 8 \tag{1.1.4}$$

$$\sqrt{\begin{pmatrix} x_1 - 3 \\ -2 \end{pmatrix}^{\mathsf{T}} \begin{pmatrix} x_1 - 3 \\ -2 \end{pmatrix}} = 8 \tag{1.1.5}$$

$$\sqrt{\begin{pmatrix} x_1 - 3 & -2 \end{pmatrix} \begin{pmatrix} x_1 - 3 \\ -2 \end{pmatrix}} = 8 \tag{1.1.6}$$

$$\sqrt{\left(x_1 - 3\right)^2 + \left(-2\right)^2} = 8 \tag{1.1.7}$$

$$\left(x_1 - 3\right)^2 + 4 = 64 \tag{1.1.8}$$

$$x_1^2 - 6x_1 - 51 = 0 \tag{1.1.9}$$

Roots α, β of a quadratic equation in the form of $ax^2 + bx + c = 0$ is given as

$$\alpha, \beta = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \tag{1.1.10}$$

Solving (1.1.9) in reference to (1.1.10)

$$\alpha, \beta = \frac{-\left(-6\right) \pm \sqrt{\left(-6\right)^2 - 4\left(1\right)\left(-51\right)}}{2\left(1\right)} \tag{1.1.11}$$

$$\alpha, \beta = \frac{6 \pm \sqrt{36 + 204}}{2} \tag{1.1.12}$$

$$\alpha, \beta = 3 \pm \sqrt{60}$$

$$\alpha = 3 + 7.7495 \implies 10.75$$

$$\beta = 3 - 7.7495 \implies -4.75$$

$$\mathbf{A} = \begin{pmatrix} 10.75 \\ 2 \end{pmatrix}, \begin{pmatrix} -4.75 \\ 2 \end{pmatrix} \tag{1.1.13}$$

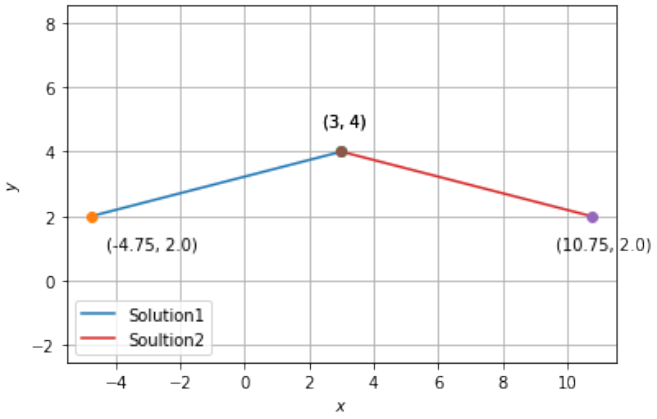

Fig. 0: Solution

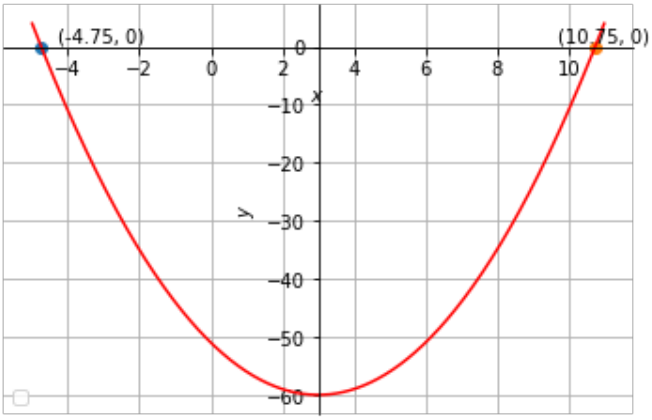

Fig. 0: Quadratic equation plot