

Assignment 1

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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

$$\begin{pmatrix} x_1 \\ 2 \end{pmatrix}, \begin{pmatrix} 3 \\ 4 \end{pmatrix} \quad (1.0.1)$$

1.1 Solution

The distance between two vectors is given by

$$\|\mathbf{A} - \mathbf{B}\| = \sqrt{(\mathbf{A} - \mathbf{B})^\top (\mathbf{A} - \mathbf{B})} \quad (1.1.1)$$

Let

$$\mathbf{A} = \begin{pmatrix} x_1 \\ 2 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 3 \\ 4 \end{pmatrix} \quad (1.1.2)$$

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

Given the distance between \mathbf{A} and \mathbf{B} is 8
From (1.1.1) (1.0.1)

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

$$\sqrt{\begin{pmatrix} x_1 - 3 \\ -2 \end{pmatrix}^\top \begin{pmatrix} x_1 - 3 \\ -2 \end{pmatrix}} = 8 \quad (1.1.5)$$

$$\sqrt{(x_1 - 3 \quad -2) \begin{pmatrix} x_1 - 3 \\ -2 \end{pmatrix}} = 8 \quad (1.1.6)$$

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

$$(x_1 - 3)^2 + 4 = 64 \quad (1.1.8)$$

$$x_1^2 - 6x_1 - 51 = 0 \quad (1.1.9)$$

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

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

Solving (1.1.9) in reference to (1.1.10)

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

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

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

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

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

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

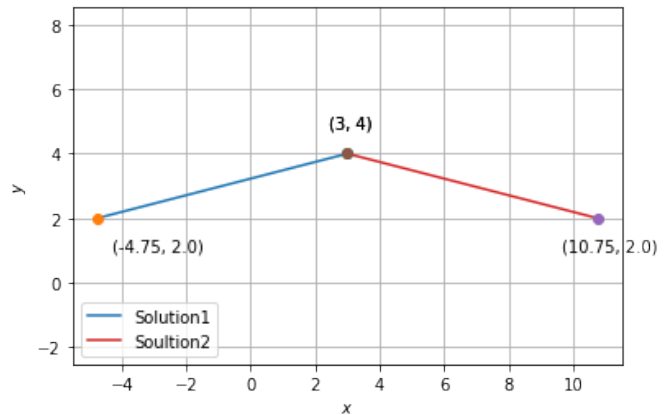


Fig. 0: Solution

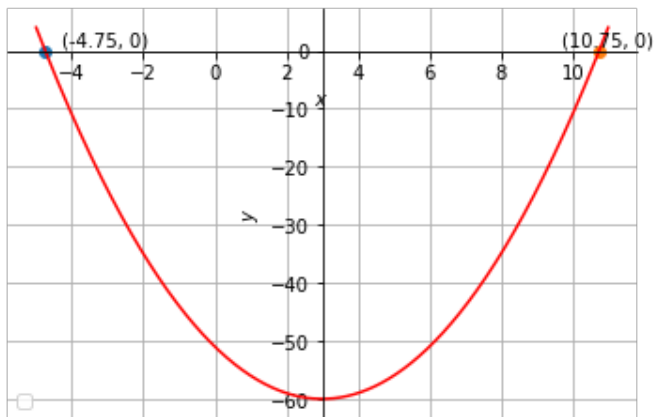


Fig. 0: Quadratic equation plot