

Assignment 1

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Download all python codes from

<https://github.com/Y.Nagarani/Matrix-Theory/tree/main/Assignment1/Codes>

and latex-tikz codes from

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From (2.0.2),

$$\|\mathbf{A}\|^2 = c^2 = p^2 + q^2 \quad (2.0.14)$$

$$\Rightarrow q = \pm \sqrt{c^2 - p^2} \quad (2.0.15)$$

$$q = \pm \sqrt{6^2 - 3.375^2} \quad (2.0.16)$$

$$q = \pm \sqrt{24.609375} \quad (2.0.17)$$

$$q = 4.960783708 \quad (2.0.18)$$

1 QUESTION No. 2.1

Construct $\triangle ABC$ of sides $a = 4$, $b = 5$ and $c=6$

2 EXPLANATION

Let us assume that:

$$\mathbf{A} = \begin{pmatrix} p \\ q \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} a \\ 0 \end{pmatrix}, \mathbf{D} = \begin{pmatrix} p \\ 0 \end{pmatrix} \quad (2.0.1)$$

Then

$$AB = \|\mathbf{A} - \mathbf{B}\|^2 = \|\mathbf{A}\|^2 = c^2 \quad \because \mathbf{B} = \mathbf{0} \quad (2.0.2)$$

$$BC = \|\mathbf{C} - \mathbf{B}\|^2 = \|\mathbf{C}\|^2 = a^2 \quad (2.0.3)$$

$$AC = \|\mathbf{A} - \mathbf{C}\|^2 = b^2 \quad (2.0.4)$$

From (2.0.4),

$$b^2 = \|\mathbf{A} - \mathbf{C}\|^2 = \|\mathbf{A} - \mathbf{C}\|^T \|\mathbf{A} - \mathbf{C}\| \quad (2.0.5)$$

$$= \mathbf{A}^T \mathbf{A} + \mathbf{C}^T \mathbf{C} - \mathbf{A}^T \mathbf{C} - \mathbf{C}^T \mathbf{A} \quad (2.0.6)$$

$$= \|\mathbf{A}\|^2 + \|\mathbf{C}\|^2 - 2\mathbf{A}^T \mathbf{C} \quad (\because \mathbf{A}^T \mathbf{C} = \mathbf{C}^T \mathbf{A}) \quad (2.0.7)$$

$$= a^2 + c^2 - 2ap \quad (2.0.8)$$

yielding

$$p = \frac{a^2 + c^2 - b^2}{2.a} \quad (2.0.9)$$

$$p = \frac{4^2 + 6^2 - 5^2}{2.4} \quad (2.0.10)$$

$$p = \frac{16 + 36 - 25}{8} \quad (2.0.11)$$

$$p = 3.375 \quad (2.0.12)$$

$$(2.0.13)$$