

Assignment 3

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Find Python Codes from below link

<https://github.com/TGURUBALAJI/INTERNSHIP-IITH/tree/main/Assignment3>

and latex-tikz codes from

<https://github.com/TGURUBALAJI/INTERNSHIP-IITH/tree/main/Assignment3>

1 EXAMPLES 1

1.1 Question 3

Find the Distance between $(-3, -2)$ and $(-6, 7)$, the axes being inclined at 60°

1.2 Solution

Let $\mathbf{A}_a = \begin{pmatrix} -3 \\ -2 \end{pmatrix}$, $\mathbf{B}_a = \begin{pmatrix} -6 \\ 7 \end{pmatrix}$

formula for finding Rectangular coordinates from angular coordinates $\mathbf{X} = \mathbf{P}\mathbf{X}_n$ where

X	Rectangular coordinates
\mathbf{X}_a	Angular coordinates
P	$\begin{bmatrix} 1 & \cos 60^\circ \\ 0 & \sin 60^\circ \end{bmatrix}$

$$\mathbf{P} = \begin{pmatrix} 1 & \cos \theta \\ 0 & \sin \theta \end{pmatrix} \quad (1.2.1)$$

$$\mathbf{A}_a = \begin{pmatrix} 1 & \cos 60^\circ \\ 0 & \sin 60^\circ \end{pmatrix} \begin{pmatrix} -3 \\ -2 \end{pmatrix} \quad (1.2.2)$$

$$\mathbf{A} = \begin{pmatrix} -3 - 2 \cos 60^\circ \\ -2 \sin 60^\circ \end{pmatrix} \quad (1.2.3)$$

$$\mathbf{B}_a = \begin{pmatrix} 1 & \cos 60^\circ \\ 0 & \sin 60^\circ \end{pmatrix} \begin{pmatrix} -6 \\ 7 \end{pmatrix} \quad (1.2.4)$$

$$\mathbf{B} = \begin{pmatrix} -6 + 7 \cos 60^\circ \\ 7 \sin 60^\circ \end{pmatrix} \quad (1.2.5)$$

$$(1.2.6)$$

The distance between two vectors is given by

$$\|\mathbf{A} - \mathbf{B}\| = \sqrt{(\mathbf{A} - \mathbf{B})^\top (\mathbf{A} - \mathbf{B})} \quad (1.2.7)$$

$$\mathbf{A} - \mathbf{B} = \begin{pmatrix} -3 - 2 \cos 60^\circ \\ -2 \sin 60^\circ \end{pmatrix} - \begin{pmatrix} -6 + 7 \cos 60^\circ \\ 7 \sin 60^\circ \end{pmatrix} \quad (1.2.8)$$

$$= \begin{pmatrix} 3 - 9 \cos 60^\circ \\ -9 \sin 60^\circ \end{pmatrix} \quad (1.2.9)$$

$$(\mathbf{A} - \mathbf{B})^\top = (3 - 9 \cos 60^\circ \quad -9 \sin 60^\circ) \quad (1.2.10)$$

Replacing (??) and (1.2.10) in (1.2.8)

$$\|\mathbf{A} - \mathbf{B}\| = \sqrt{(3 - 9 \cos 60^\circ \quad -9 \sin 60^\circ) \begin{pmatrix} 3 - 9 \cos 60^\circ \\ -9 \sin 60^\circ \end{pmatrix}} \quad (1.2.11)$$

$$= \sqrt{(3 - 9 \cos 60^\circ)^2 + (-9 \sin 60^\circ)^2} \quad (1.2.12)$$

$$= \sqrt{9 + 81 \cos^2 60^\circ - 54 \cos 60^\circ + 81 \sin^2 60^\circ} \quad (1.2.13)$$

$$= \sqrt{9 + 81 - 54 \cos 60^\circ} \quad (1.2.14)$$

$$= \sqrt{90 - 27} \quad (1.2.15)$$

$$= \sqrt{63}$$

$$= 7.9372$$

Distance between two points is 7.9372

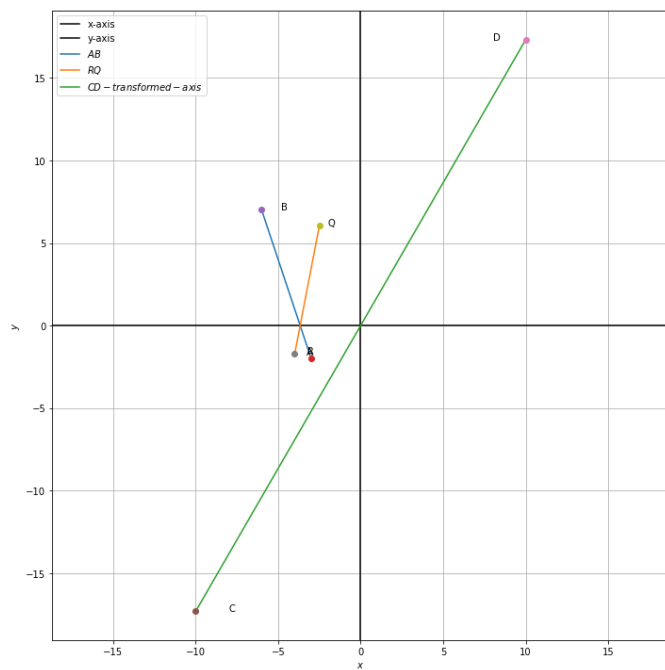


Fig. 0