Assignment-7

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Download all python codes from

https://github.com/ThurpuNaveena/Assignment7/tree/main/Assignment7

and latex-tikz codes from

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1 QUESTION No-2.43

Find the values of x,y,z if the matrix A=$\begin{pmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{pmatrix}$ satisfy the equation $A^\top A$=I.

2 Solution

Given that

$$A = \begin{pmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{pmatrix} \tag{2.0.1}$$

$$A^\top = \begin{pmatrix} 0 & x & x \\ 2y & y & -y \\ z & -z & z \end{pmatrix} \tag{2.0.2}$$

$$I = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \tag{2.0.3}$$

$$A^\top A = I \tag{2.0.4}$$

putting values in (2.0.4)

$$\begin{pmatrix} 0 & x & x \\ 2y & y & -y \\ z & -z & z \end{pmatrix}\begin{pmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \tag{2.0.5}$$

$$\begin{pmatrix} 2x^2 & 0 & 0 \\ 0 & 6y^2 & 0 \\ 0 & 0 & 3z^2 \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \tag{2.0.6}$$

since matrices are equal

$$2x^2 = 1 \implies x = \pm\frac{1}{\sqrt{2}} \tag{2.0.7}$$

$$6y^2 = 1 \implies y = \pm\frac{1}{\sqrt{6}} \tag{2.0.8}$$

$$3z^2 = 1 \implies z = \pm\frac{1}{\sqrt{3}} \tag{2.0.9}$$