23i-2088
CY-A.
Sarika Sangree Linear Algebra Date

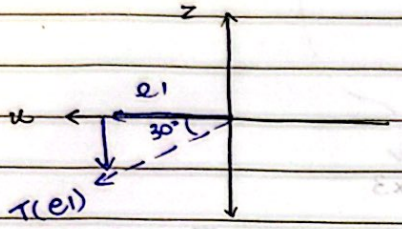
Homework # 5.

Q1. $\begin{bmatrix} A_{3\times3} & \begin{matrix}0\\0\\0\end{matrix} \\ \begin{matrix}0 & 0 & 0\end{matrix} & 1 \end{bmatrix}$

Find A.

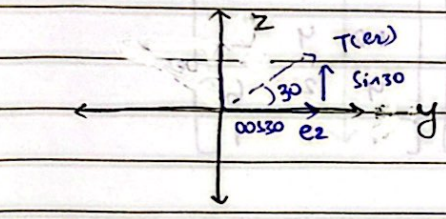
$A = [\,T(e_1) \quad T(e_2) \quad T(e_3)\,]$

$T(e_3) = \begin{bmatrix}0\\0\\1\end{bmatrix}$ unchanged as rotation about z-axis.

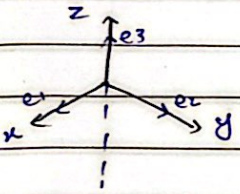


$T(e_1) = \begin{bmatrix}\cos 30^\circ\\0\\-\sin 30^\circ\end{bmatrix}$

$T(e_2) = \begin{bmatrix}0\\\cos 30\\\sin 30\end{bmatrix}$



$A = \begin{bmatrix} \cos 30 & 0 & 0 & 0 \\ 0 & \cos 30 & 0 & 0 \\ -\sin 30 & \sin 30 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$



$A = \begin{bmatrix} \sqrt{3}/2 & 0 & 0 & 0 \\ 0 & \sqrt{3}/2 & 0 & 0 \\ -1/2 & 1/2 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

Now we translate by vector $p = (5, -2, 1)$

map $(x, y, z, 1)$ to $(x-5, y-2, z+1, 1)$.

$M = \begin{bmatrix} 1 & 0 & 0 & -5 \\ 0 & 1 & 0 & -2 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

Now $M \cdot A = \begin{bmatrix} \sqrt{3}/2 & 0 & 0 & 0 \\ 0 & \sqrt{3}/2 & 0 & 0 \\ -1/2 & 1/2 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 & -5 \\ 0 & 1 & 0 & -2 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

$\sqrt{3}/2 \times 1 + 0 \times 0 + 0 \times 0 + 0 \times 0$; $\sqrt{3}/2 \times 0 + 0 \times 1 + 0 \times 0 + 0 \times 0$; 0 ; $-\sqrt{3}/2 \times$

0 ; $0 + \sqrt{3}/2$; 0 ; $-\sqrt{3}/2 \times$

$-1/2$; $1/2$; 1 ; $\frac{5}{2} - 1 + 1$

0 ; 0 ; 0 ; 1

Ans: $\begin{bmatrix} \sqrt{3}/2 & 0 & 0 & -\frac{5\sqrt{3}}{2} \\ 0 & \sqrt{3}/2 & 0 & -\sqrt{3}/2 \\ -1/2 & 1/2 & 1 & 5/2 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

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Q2. $\alpha = 10$

So $P = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & -1/10 & 1 \end{bmatrix}$ 4×4

(4.2, 1.2, 4)

(4.2, 1.2, 4, 0)

$D = \begin{bmatrix} 4.2 & 6 & 2 \\ 1.2 & 4 & 2 \\ 4 & 2 & 6 \\ 1 & 1 & 1 \end{bmatrix}$ 4×3

$P \times D = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & -1/10 & 1 \end{bmatrix} \begin{bmatrix} 4.2 & 6 & 2 \\ 1.2 & 4 & 2 \\ 4 & 2 & 6 \\ 1 & 1 & 1 \end{bmatrix}$

$1 \times 4.2 + 0$ $\quad 1 \times 6 + 0$ $\quad 1 \times 2 + 0$

$1 \times 1.2 + 0$ $\quad 1 \times 4 + 0$ $\quad 1 \times 2 + 0$

0 $\quad 0$ $\quad 0$

$0 - 1/10 \times 4 + 1 \times 1$ $\quad -1/10 \times 2 + 1 \times 1$ $\quad -1/10 \times 6 + 1$

$= \begin{bmatrix} 4.2 & 6 & 2 \\ 1.2 & 4 & 2 \\ 0 & 0 & 0 \\ 0.6 & 0.6 & 0.4 \end{bmatrix}$