

ENGR 222

Assignment 6 Submission

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2. Suppose S is the subspace in \mathbb{R}^4 is spanned by $\begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 1 \\ 1 \end{bmatrix}$.

Find the point P closest to $\begin{bmatrix} 1 \\ 3 \\ 8 \\ 2 \end{bmatrix}$ (i.e. orthogonal projection).

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$$\text{For } A = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \\ 1 & 0 & 1 \end{bmatrix} \text{ and } v = \begin{bmatrix} 1 \\ 3 \\ 8 \\ 2 \end{bmatrix}, x = A^+ \cdot v$$

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A = Matrix([1,1,0],[1,1,0],[1,0,1],[1,0,1])
v = Matrix([1,3,8,2])
x = A.pinv()*v
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$$x = \begin{bmatrix} \frac{7}{3} \\ \frac{1}{3} \\ \frac{8}{3} \\ \frac{5}{3} \end{bmatrix}, Ax = \begin{bmatrix} 2 \\ 2 \\ 5 \\ 5 \end{bmatrix}$$

5. Let $T: \mathbb{R}^2 \rightarrow \mathbb{R}^3$ is the linear transformation whose matrix is $A = \begin{bmatrix} 7 & 1 \\ 0 & 0 \\ 5 & 5 \end{bmatrix}$.

The image of the circle of radius 1 with centre at $(0,0)$ under T is an ellipse with the centre at $(0,0,0)$.

Find the points on this ellipse farthest from $(0,0,0)$ and the points closest to $(0,0,0)$.

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