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).

For A $= \begin{bmatrix}1&1&0\\1&1&0\\1&0&1\\1&0&1\end{bmatrix}$ 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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$$x = \begin{bmatrix}\frac{7}{3}\\-\frac{1}{3}\\\frac{8}{3}\end{bmatrix}$$

5. Let $T : \mathbb{R}^2 \to \mathbb{R}^3$ 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 eclipse with the centre at $(0, 0, 0)$.

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