Homework #1

1.

A vector is given by

$$ {}^{B}P = \begin{bmatrix} 1.0 \\ 5.0 \\ 10.0 \end{bmatrix}. $$

Given

$$ {}^{B}_{A}T = \begin{bmatrix} 1.0 & 0.0 & 0.0 & 3.0 \\ 0.0 & 0.6 & 0.8 & -1.0 \\ 0.0 & -0.8 & 0.6 & 1.0 \\ 0.0 & 0.0 & 0.0 & 1.0 \end{bmatrix}, $$

compute ${}^{A}P$.

2.

Given the following 3x3 matrix,

$$ R = \begin{bmatrix} 0 & \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & \frac{1}{2} & -\frac{1}{2} \\ -\frac{1}{\sqrt{2}} & \frac{1}{2} & -\frac{1}{2} \end{bmatrix}. $$

a) Show that it is a rotation matrix.
b) In order to reach this orientation, what are the equivalent angle and axes?
c) In order to reach this orientation, what are Z-Y-X Fixed angles?
d) In order to reach this orientation, what are Z-X-Z Euler angles?
e) In order to reach this orientation, what are the Euler parameters?