Checkpoint 1

$$P_{xy} = R_x \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\frac{\pi}{4} & -\sin\frac{\pi}{4} \\ 0 & \sin\frac{\pi}{4} & \cos\frac{\pi}{4} \end{bmatrix} \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \\ \sqrt{2} \end{pmatrix} \begin{bmatrix} \cos\pi/4 & 0 & \sin\frac{\pi}{4} \\ 0 & 1 & 0 \\ -\sin\pi/4 & 0 & \cos\pi/4 \end{bmatrix}$$

$\frac{\sqrt{2}}{2}+1$ $\qquad$ $-\frac{\sqrt{2}}{2}+1$

$$P_{xy} = \begin{pmatrix} \frac{\sqrt{2}}{2}+1 \\ 0 \\ -\frac{\sqrt{2}}{2}+1 \end{pmatrix}$$

Checkpoint 2

$$\begin{bmatrix} \cos\frac{\pi}{4} & 0 & \sin\pi/4 \\ 0 & 1 & 0 \\ -\sin\frac{\pi}{4} & 0 & \cos\frac{\pi}{4} \end{bmatrix} \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} = \begin{pmatrix} \sqrt{2} \\ 1 \\ 0 \end{pmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\pi/4 & -\sin\pi/4 \\ 0 & \sin\pi/4 & \cos\pi/4 \end{bmatrix}$$

$$P_{xy} = \begin{pmatrix} \sqrt{2} \\ \sqrt{2}/2 \\ \sqrt{2}/2 \end{pmatrix}$$

Checkpoint 3

$$\epsilon_1 = \begin{pmatrix} 3 \\ 0 \\ 3 \end{pmatrix} \begin{matrix} = 2+1 \\ = -1+1 \\ = 1+2 \end{matrix}$$

Checkpoint 4

$$\epsilon_2 = \begin{pmatrix} 3 \\ -2 \\ -\sqrt{2} \\ 2 \end{pmatrix}$$