

Question #1

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

$$q'_1 = a_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

$$q_{11} = \|q'_1\| = \sqrt{1^2 + 1^2 + 1^2} = \sqrt{3} = 1.7321$$

$$q_1 = \frac{1}{\|q'_1\|} \cdot q'_1 = \frac{1}{1.7321} \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 0.5774 \\ 0.5774 \\ 0.5774 \end{bmatrix}$$

$$r_{12} = q_1^T \cdot a_2 = [0.5774 \quad 0.5774 \quad 0.5774] \cdot \begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix} = 0$$

$$q'_2 = a_2 - r_{12} q_1 = \begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix} - \begin{bmatrix} 0.5774 \\ 0.5774 \\ 0.5774 \end{bmatrix} = \begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix}$$

$$q_{22} = \|q'_2\| = \sqrt{(-1)^2 + 1^2 + 0^2} = \sqrt{2} = 1.4142$$