1. **a)** Find the standard matrix B for proj_L, where $L = \text{Span}\left\{ \begin{pmatrix} 1 \\ 1 \\ -1 \end{pmatrix} \right\}$.

b) What are the eigenvalues of B? What are their algebraic multiplicities?

2. Find an orthonormal basis for the subspace of $\mathbf{R}^4$ spanned by

$$v_1 = \begin{pmatrix} 1 \\ -1 \\ 1 \\ 1 \end{pmatrix}, \quad v_2 = \begin{pmatrix} 6 \\ -2 \\ 2 \\ 6 \end{pmatrix}, \quad \text{and} \quad v_3 = \begin{pmatrix} 4 \\ 20 \\ -14 \\ 10 \end{pmatrix}.$$

3.

a) Find the least squares solution $\hat{x}$ to $Ax = e_1$, where $A = \begin{pmatrix} 1 & 1 \\ 0 & 1 \\ -1 & 1 \end{pmatrix}$.

b) Find the best fit line $y = Ax + B$ through the points $(0,0)$, $(1,8)$, $(3,8)$, and $(4,20)$.

c) Set up an equation to find the best fit parabola $y = Ax^2 + Bx + C$ through the points $(0,0)$, $(1,8)$, $(3,8)$, and $(4,20)$.