1. a) Find the standard matrix $B$ for $\text{proj}_L$, 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 $\mathbb{R}^4$ spanned by

\[ v_1 = \begin{pmatrix} 1 \\ -1 \\ 1 \\ 1 \end{pmatrix}, \quad v_2 = \begin{pmatrix} 6 \\ -2 \\ -2 \\ 2 \end{pmatrix}, \quad \text{and} \quad v_3 = \begin{pmatrix} 4 \\ 20 \\ -14 \\ 10 \end{pmatrix}. \]
3.  a) Find the least squares solution $\bar{x}$ 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 $(4, 20)$. 