SP1

1. Check that
$$Q = \begin{bmatrix} 5/13 & 12/13 \\ -12/13 & 5/13 \end{bmatrix}$$
is orthogonal

2. Let
$$A = \begin{bmatrix} 9 & -2 \\ -2 & 6 \end{bmatrix}.$$
   (a) Is A symmetric?
   (b) Determine the eigen-values and eigen-vectors of A.
   (c) Find the spectral decomposition of A.
   (d) Find A^{-1} using the answer to the previous part.

3. Let $I_5 = diag(1, 1, 1, 1, 1)$ be the 5×5 identity matrix.
   (a) What is the spectral decomposition of I_5?
   (b) What is the singular value decomposition of I_5?

4. Let U be an orthogonal matrix. What is the singular value decomposition of U?

5. Let A be the following matrix
$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$$
What is the SVD of A?