1. (10 points) Define the matrices: (a) identity matrix \( I \), (b) singular matrix \( A \), (c) spectral matrix \( S \), (d) modal matrix \( M \), (e) orthogonal matrix \( P \).

2. (10 points) Using orthogonal matrix and diagonalization, identify and graph (to scale) the conic section

\[
16x^2 + 24xy + 9y^2 - 3x + 4y = 10
\]

\[
\lambda_1 = 0, \quad \lambda_2 = 25
\]

\[
P = \frac{1}{5} \begin{bmatrix} 3 & 4 \\ -4 & 3 \end{bmatrix}
\]

\[
R = P^T = \frac{1}{5} \begin{bmatrix} 3 & -4 \\ 4 & 3 \end{bmatrix}
\]

\[
\lambda_1 X^2 + \lambda_2 Y^2 + B X = k
\]

\[
25Y^2 - 5X = 10
\]

\[
5Y^2 = X + 2
\]

It is a parabola.