1. Use the power method to find the dominant eigenvalue and associated eigenvector of the following matrices: (a) \[
\begin{pmatrix}
-2 & 0 & 1 \\
-3 & -2 & 0 \\
-2 & 5 & 4
\end{pmatrix},
\]  (b) \[
\begin{pmatrix}
4 & 1 & 0 & 1 \\
1 & 4 & 1 & 0 \\
0 & 1 & 4 & 1 \\
1 & 0 & 1 & 4
\end{pmatrix}
\].

2. Use Newton’s Method to find all points of intersection of the following pairs of plane curves: \( x^3 + y^3 = 3, \ x^2 - y^2 = 2. \)

3. The system \( x^2 + xz = 2, \ xy - z^2 = -1, \ y^2 + z^2 = 1, \) has a solution \( x^* = 1, \ y^* = 0, \ z^* = 1. \) Consider a fixed point iteration scheme with \[
g(x, y, z) = \begin{pmatrix}
x + \alpha(x^2 + xz - 2), y + \alpha(xy - z^2 + 1), z + \alpha(y^2 + z^2 - 1)
\end{pmatrix}^T,
\]  where \( \alpha \) is a constant.  (a) For which values of \( \alpha \) does the iterative scheme converge to the solution when the initial guess is nearby? (b) What is the best value of \( \alpha \) as far as the rate of convergence goes?  (c) For the value of \( \alpha \) from part (a) (or another value of your own choosing) about how many iterations are required to approximate the solution to 5 decimal places when the initial guess is \( x^{(0)} = \frac{5}{6}, \ y^{(0)} = -\frac{1}{3}, \ z^{(0)} = \frac{9}{8}. \) Test your estimate by running the iteration. (d) Write down the Newton iteration scheme for this system. (e) Answer part (c) for the Newton scheme.