Tutorial 4

1. Solve the following system of equations by Gauss Jacobi and Gauss Seidel methods, with $\varepsilon_r \leq 0.1\%$. Use starting guess of (0,0,0) for both the methods.

$$\begin{bmatrix} 9.3746 & 3.0416 & -2.4371 \\ 3.0416 & 6.1832 & 1.2163 \\ -2.4371 & 1.2163 & 8.4429 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 9.2333 \\ 8.2049 \\ 3.9339 \end{bmatrix}$$

2. Solve the following equations using (a) fixed-point iteration and (b) Newton-Raphson method, starting with an initial guess of x=1 and y=1 and $\varepsilon_r \leq 0.1\%$.

$$x^2 - x + y - 0.5 = 0$$
$$x^2 - 5xy - y = 0$$

3. Consider the following Matrix:

$$\begin{bmatrix} 7 & -2 & 1 \\ -2 & 10 & -2 \\ 1 & -2 & 7 \end{bmatrix}$$

   a) Find the largest eigenvalue and the corresponding eigenvector using the Power method with $\varepsilon_r \leq 0.1\%$. Take the starting z vector as $\{1,0,0\}^T$.

   b) Obtain the equation of the characteristic polynomial using Fadeev-Leverrier Method.

   c) Perform two iterations of the QR algorithm and compute the approximate eigenvalues of the matrix after this iteration.