

## Lab Assignment – 3

1. The following data points (10.0000, 0), (10.2000, 0.0040), (10.4000, 0.0160), (10.6000, 0.0360), (10.8000, 0.0640), and (11.0000, 0.1000) are coming from the following quadratic equation  $y = ax^2 + bx + c$ . By using the given data points and the quadratic equation form a system of linear equations and solve it to find the values of  $a$ ,  $b$ , and  $c$  using the QR decomposition method. Also, plot the curve to show that the data points fit to the curve. (Verify that your decomposition is correct by checking the upper triangular condition over  $R$ ,  $Q^T \cdot Q = \text{Identity matrix}$ , and  $Q \cdot R$  gives back  $A$  up to some error bound). Use of any inbuilt function to find the QR decomposition directly is not allowed.
2. Write python functions from scratch to solve system of linear equations using following iterative methods:
  - a) Jacobi's Iterative Method
  - b) Gauss Seidel Method
  - c) Successive Over Relaxation Method

Your implementation should be general to handle any number of equations and any number of variables.

Check your implementation on the following test problem:

$$2.412x + 9.879y + 1.564z = 4.89$$

$$1.876x + 2.985y - 11.62z = -0.972$$

$$12.214x + 2.367y + 3.672z = 7.814$$

Compare the number of iterations required until convergence using both methods (use error tolerance of  $10^{-5}$ ). Also draw the convergence plot for each method.