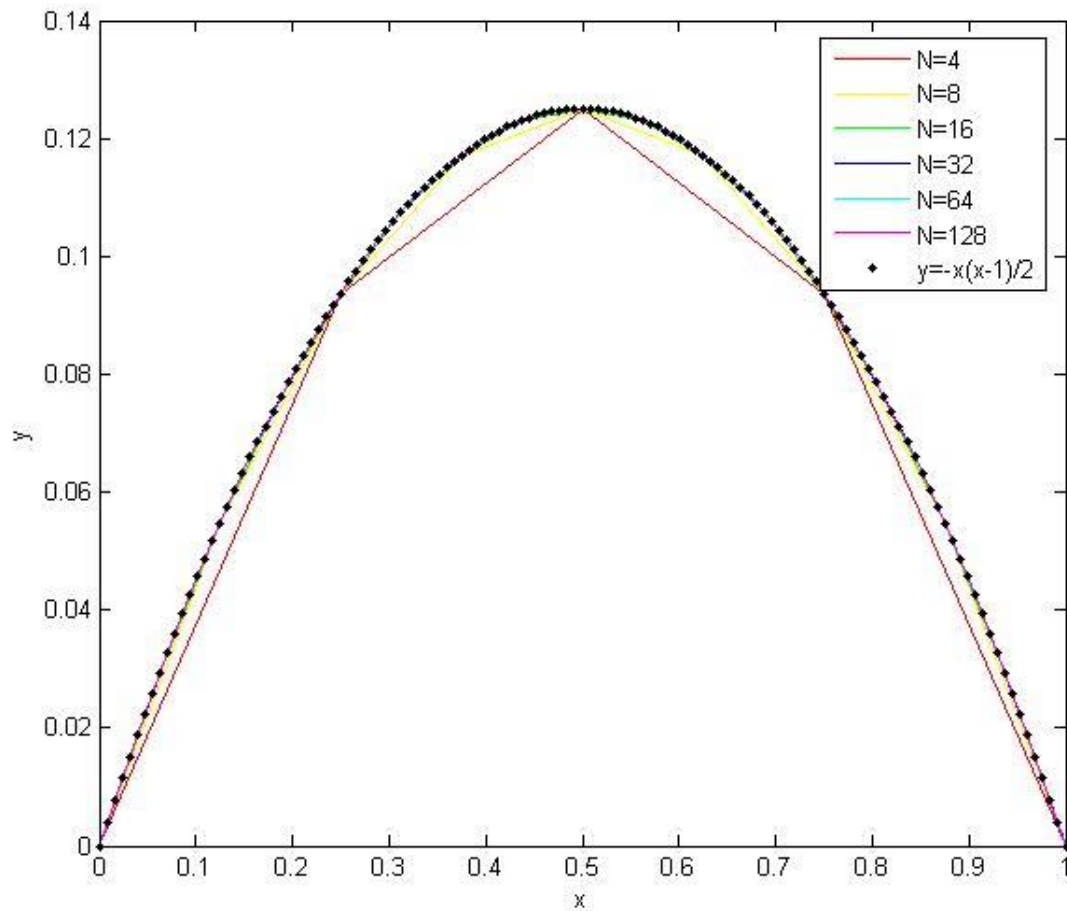# Math 6635 Homework 6 Solution

Problem 16: Cholesky Factorization

Command Window

```
x =    -1.3611
       0.4722
       5.2778
       0.9444
```

Problem 17:

Problem 18:

$$I - D^{-1}A = I - \begin{pmatrix} \frac{1}{a_{11}} & & \cdots & -0 & 0 \\ & \frac{1}{a_{22}} & & & \vdots \\ & & 0 & & \vdots \\ 0 & \cdots & & & \frac{1}{a_{nn}} \end{pmatrix} \begin{pmatrix} a_{11} & a_{12} & - & - & a_{1n} \\ a_{21} & - & - & - & a_{2n} \\ & & & & \vdots \\ a_{n1} & - & & - & a_{nn} \end{pmatrix}$$

$$= \begin{pmatrix} 1 & & \cdots & - & 0 \\ & 1 & & & \\ & & \ddots & & \\ 0 & - & & & 1 \end{pmatrix} - \begin{pmatrix} 1 & \frac{a_{12}}{a_{11}} & \cdots & & \frac{a_{1n}}{a_{11}} \\ \frac{a_{21}}{a_{22}} & \frac{a_{22}}{a_{22}} & \cdots & & \frac{a_{2n}}{a_{22}} \\ & & \vdots & & \\ \frac{a_{n1}}{a_{nn}} & \cdots & & - & \frac{a_{nn}}{a_{nn}}=1 \end{pmatrix}$$

$$= - \begin{pmatrix} 0 & \frac{a_{12}}{a_{11}} & \cdots & & \frac{a_{1n}}{a_{11}} \\ \frac{a_{21}}{a_{11}} & 0 & \ddots & & 1 \\ \vdots & & & & \vdots \\ \frac{a_{n1}}{a_{nn}} & \frac{a_{n2}}{a_{nn}} & - & - & 0 \end{pmatrix}$$

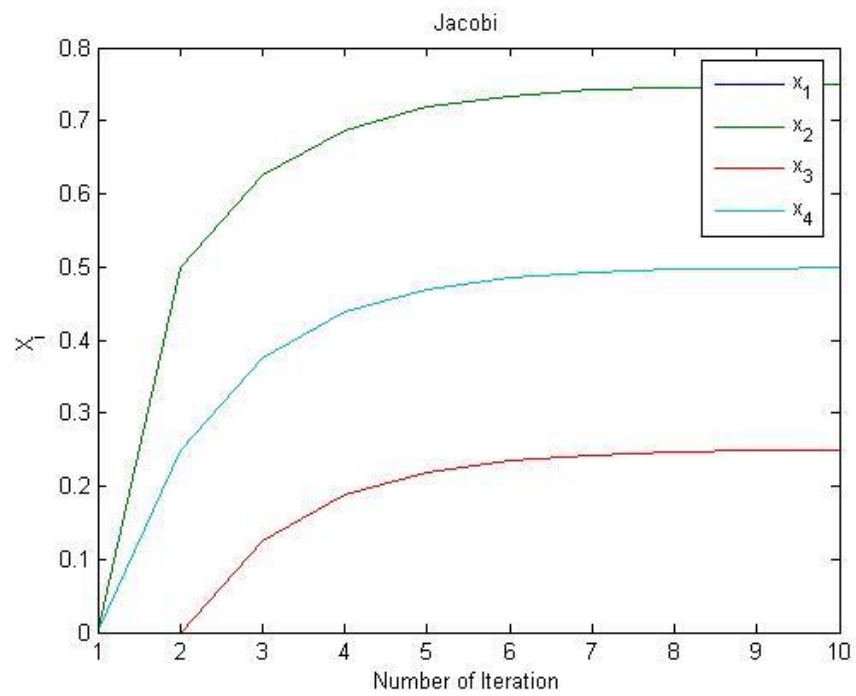$$\| I - D^{-1}A \|_\infty = \max_{1 \le i \le n} \sum_{j \ne i} \frac{|a_{ij}|}{|a_{ii}|}$$

Problem 19:

Exact solution is:

Command Window
exact solution is:
ans =

    0.5000
    0.7500
    0.2500
    0.5000

(a). Jacobi

(b). Gauss-Seidel