

CS 3500 AA – Numerical Methods I
Fall 2015
Homework Problem Set #6
Due: 10/08/2015

Be sure to do all your work on separate paper, and include all steps where appropriate. All homework must follow the formatting rules posted on Blackboard.

1. Show that the following statements are true or provide counterexamples to show they are not.

(a) The product of two symmetric matrices is symmetric.

(b) The inverse of an invertible symmetric matrix is an invertible symmetric matrix.

(c) If A and B are $n \times n$ matrices, then $(AB)^T = A^T B^T$.

2. Show that the product of two $n \times n$ upper triangular matrices is upper triangular.

3. Solve the following linear system

$$\begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ -1 & 0 & 1 \end{bmatrix} \begin{bmatrix} 2 & 3 & -1 \\ 0 & -2 & 1 \\ 0 & 0 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 2 \\ -1 \\ 1 \end{bmatrix}$$

4. Compute the l_1 , l_2 and l_∞ norms for each of the following vectors.

$$\begin{array}{lll} \text{(a) } x = \begin{bmatrix} 3 \\ -5 \\ \sqrt{2} \end{bmatrix} & \text{(b) } x = \begin{bmatrix} e \\ \pi \\ 2\sqrt{3} \end{bmatrix} & \text{(c) } x = \begin{bmatrix} -3 \\ 2 \\ -4 \\ 8 \\ -1 \end{bmatrix} \end{array}$$

5. Compute the l_1 , l_2 and l_∞ norms of each of the following matrices.

$$\begin{array}{ll} \text{(a) } A = \begin{bmatrix} 3 & -5 \\ -5 & 4 \end{bmatrix} & \text{(b) } A = \begin{bmatrix} 4 & 1 \\ 0 & 4 \end{bmatrix} \end{array}$$