

# MATH 6701 - HW 1

Justify all your answers

Name:

**Problem 1 (5 points):** Solve the system

$$-x_2 + x_3 = 1$$

$$x_1 + 2x_2 + x_4 = 2$$

$$x_1 - x_2 + 3x_3 + x_4 = 5$$

**Problem 2 (5 points):** The set of solutions to a linear system of homogeneous equations is always a subspace. Homogeneous means that the right hand side is 0.

Find an orthonormal basis of the set of solutions of

$$x_1 + x_2 + x_4 = 0$$

$$x_1 + 2x_2 + x_3 = 0$$

**Problem 3 (5 points):** Let

$$A = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix}.$$

Compute  $A^{-1}$ .

**Problem 4 (5 points):** Find the eigenvalues and eigenvectors of

$$A = \begin{bmatrix} 2 & -1 \\ 5 & 0 \end{bmatrix}.$$

**Problem 5 (5 points):** Diagonalize

$$A = \begin{bmatrix} -1 & 0 & 0 \\ 0 & 0 & 2 \\ 0 & 2 & 0 \end{bmatrix}.$$

**Problem 6 (5 points):** Find the line that best fit the data  $\begin{bmatrix} 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 2 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 2 \end{bmatrix},$