Midterm Exam
MATH 330: Spring 2017

Last Name:_____

First Name:_____

Total Score: _____ / 60

Instructions: You must show your work to receive full credit. You are allowed to use a scientific calculator, but no graphing calculators or other electronics are allowed. Any student caught cheating or helping another student cheat will receive a grade of F on the exam.

1. Write the following system as a matrix equation (do *not* solve the system).

$$\begin{array}{rcrcrl} -x_1 & + & 2x_2 & - & 6x_3 & = 2 \\ 3x_1 & & & + & x_3 & = -1 \\ 4x_1 & - & x_2 & + & 3x_3 & = 4. \end{array}$$

2. Let $A = \begin{bmatrix} 2 & 1 & -1 & 4 \\ 1 & 0 & 3 & 1 \\ -1 & 3 & -24 & -1 \end{bmatrix}$. Find a basis for the column space $C(A)$.

3. Describe all the solutions to $A\vec{x} = \vec{b}$ where

$$A = \begin{bmatrix} 1 & -3 & 1 \\ -2 & 6 & -1 \\ 3 & -9 & 1 \end{bmatrix} \qquad \text{and} \qquad \vec{b} = \begin{bmatrix} -3 \\ 1 \\ 1 \end{bmatrix}.$$

Write your solution in the form $\vec{x} = \vec{x}_p + \vec{x}_n$.

4. Determine whether the columns of $A = \begin{bmatrix} 1 & 3 & -2 \\ 2 & 1 & 1 \\ -4 & 3 & -7 \end{bmatrix}$ are linearly independent.

5. Find the inverse of the matrix A, if it exists. You may use any technique we have learned (e.g., Gauss-Jordan Elimination or Cramer's Rule).

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & -1 & 4 \\ 1 & 3 & 0 \end{bmatrix}$$