MTH 261 Graded HW 6 **Name ____**

This assignment is due at 6:00 PM on Monday, May 15

<u>**You should not be working on this in class right before it is due; you have 5 days to get this done – it should be done well before ten minutes before it is due**</u>.

1. Demonstrate, both implicitly and explicitly, that the linear transformation T, given below, is neither one-to-one nor onto $\mathbb{R}^3$. (See Example 7.6.)

$$T\left(\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}\right) = \begin{bmatrix} x_1 + x_2 - x_3 \\ x_1 - x_2 - x_3 \\ x_1 + 7x_2 - x_3 \end{bmatrix}$$

2. Determine and state a basis for the row space of the matrix A (given below) – show the necessary work (you may use your calculator). Then express each row of A as a linear combination of the stated basis vectors.

$$A = \begin{bmatrix} 2 & -4 & -3 & -3 & 9 \\ -2 & 4 & 1 & 5 & -7 \\ 1 & -2 & 2 & -5 & 1 \end{bmatrix}$$

3. Let $A = \begin{bmatrix} 2 & -4 & -3 & 17 & 5 & 4 \\ 3 & -6 & -2 & 18 & 5 & 2 \\ -1 & 2 & 3 & -13 & -4 & -1 \\ 4 & -8 & 1 & 13 & 3 & 1 \end{bmatrix}$. Note that $A \sim \begin{bmatrix} 1 & -2 & 0 & 4 & 1 & 0 \\ 0 & 0 & 1 & -3 & -1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$.

Fill-in each of the following blanks.

The column space of M is a ________________-dimensional subspace of $\mathbb{R}^{\_\_\_\_}$.

The row space of M is a ________________-dimensional subspace of $\mathbb{R}^{\_\_\_\_}$.

The null space of M is a ________________-dimensional subspace of $\mathbb{R}^{\_\_\_\_}$.

The column space of M^{T} is a ________________-dimensional subspace of $\mathbb{R}^{\_\_\_\_}$.

The row space of M^{T} is a ________________-dimensional subspace of $\mathbb{R}^{\_\_\_\_}$.

The null space of M^{T} is a ________________-dimensional subspace of $\mathbb{R}^{\_\_\_\_}$.