MATH 54 – MOCK MIDTERM 1

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Name: ______________________________________

Instructions: This is a mock midterm, designed to give you extra practice for the actual midterm. Good luck!!!

1		15
2		20
3		10
4		10
5		10
6		10
7		15
8		10
Total		100

Date: Friday, February 20th, 2015.

1. *(15 points)* Solve the following system (or say it has no solutions):

$$\begin{cases} x + y + z = 0 \\ 2x + 2z = 0 \\ 3x + y + 3z = 0 \end{cases}$$

2. *(20 points)* Find the inverse of the following matrix:

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

3. *(10 points)* What's the next elementary row operation you would use to transform the following matrix in row-echelon form? What is the corresponding elementary matrix?

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

4. *(10 points, 5 points each)* Evaluate the following products if they are defined, or say 'undefined'

(a) AB, where:

$$A = \begin{bmatrix} 2 & 5 \\ 0 & 7 \\ -1 & 3 \end{bmatrix}, B = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

(b) AB, where:

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

5. *(10 points)* Suppose $T : \mathbb{R}^2 \to \mathbb{R}^2$ is a linear transformation which reflects points in the plane about the origin.

(a) (5 points) Find the matrix A of T.

(b) (5 points) Use A to find $T(1,1)$.

6. *(10 points)* Find the determinant of the following matrix A:

$$A = \begin{bmatrix} 1 & 42 & 536 & 789 & 4201 & 123456789 \\ 0 & 1 & 2012 & 2014 & \pi m & \text{Dolphin} \\ 0 & 0 & 2 & 0 & 4 & 5 \\ 0 & 0 & 0 & 0 & 3 & 1 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 4 & 0 & 2 & -1 \end{bmatrix}$$

7. *(15 = 10 + 5 points)*

(a) Find a basis for $Col(A)$, where:

$$A = \begin{bmatrix} 2 & -3 & 6 & 2 & 5 \\ -2 & 3 & -3 & -3 & -4 \\ 4 & -6 & 9 & 5 & 0 \\ -2 & 3 & 3 & -4 & 1 \end{bmatrix}$$

(b) What is $dim(Col(A))$?

8. *(10 points)* Find a basis for $Nul(A)$ and a basis for $Col(A)$, where A is the following matrix:

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