MATH 54 – MOCK MIDTERM 1

PEYAM RYAN TABRIZIAN

Name: ____

Instructions: This is a mock midterm and it's designed to give you an idea of what the actual midterm will look like.

NOTE: The actual midterm will be **VERY** similar to this mock midterm (in length and format-wise). So if you know how to do all the questions on this exam, you'll be able to ace the actual midterm. However, the T/F questions might be different!

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

Date: Friday, June 29th, 2012.

1. *(10 points, 2 pts each)*

Label the following statements as **T** or **F**.

NOTE: In this question, you do **NOT** have to show your work! Don't spend *too* much time on each question!

(a) If the augmented matrix of the system $A\mathbf{x} = \mathbf{b}$ has a row of the form $\begin{bmatrix} 0 & 0 & 0 & 1 \end{bmatrix}$, then the corresponding system has no solutions.

(b) If A and B are two 2×2 matrices, then $det(AB) = det(BA)$

(c) The equation $A\mathbf{x} = \mathbf{0}$ always has either one or infinitely many solutions.

(d) If A is a 3×3 matrix with two pivot positions, then the equation $A\mathbf{x} = \mathbf{0}$ has a nontrivial solution.

(e) If A, B, C are square matrices with $AB = AC$, then $B = C$

2. *(10 points, 5 points each)* Label the following statements as **TRUE** or **FALSE**. In this question, you **HAVE** to justify your answer!!!

This means:

- If the answer is **TRUE**, you have to explain **WHY** it is true (possibly by citing a theorem)

- If the answer is **FALSE**, you have to give a specific **COUNTEREXAMPLE**. You also have to explain why the counterexample is in fact a counterexample to the statement!

(a) If A and B are any $n \times n$ matrices, then $(A+B)^{-1} = A^{-1}+B^{-1}$

(b) If A (not necessarily square) has a pivot in every row, then the system $A\mathbf{x} = \mathbf{b}$ is always consistent.

3. *(15 points)* Solve the following system of equations (or say it has no solutions):

$$\begin{cases} 2x + 2y + z = 2 \\ x - y + 3z = 3 \\ 3x + 5y = 1 \end{cases}$$

4. *(20 points)* Solve the following system $A\mathbf{x} = \mathbf{b}$, where:

$$A = \begin{bmatrix} 1 & 2 & -3 & 9 \\ 2 & -2 & 5 & -9 \\ 1 & -1 & 0 & 3 \\ 4 & 3 & -1 & 8 \end{bmatrix} \qquad \mathbf{b} = \begin{bmatrix} 5 \\ -2 \\ -1 \\ 10 \end{bmatrix}$$

Write your answer in (parametric) vector form

5. *(15 points)* Calculate AB, where A and B are given, or say that AB is undefined.

(a)

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

(b)

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

6. *(15 points)* Find A^{-1} (or say 'A is not invertible') where:

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

7. *(15 points)* Find $det(A)$, where:

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