Instructor: Leo Goldmakher

NAME: _____

SECTION: _____

Williams College
Department of Mathematics and Statistics

MATH 250 : LINEAR ALGEBRA

Problem Set 7 – due Friday, April 29th

INSTRUCTIONS:
This assignment must be turned in *as a hard copy* to the mailbox of your TA (on your left as soon as you enter Bronfman from Science Quad, labelled by last name), by **5pm** sharp. *Assignments submitted later than Friday at 5pm will be returned without being marked.*

Please print and attach this page as the first page of your submitted problem set.

PROBLEM	GRADE
7.1	
7.2	
7.3	
7.4	
Total	

Please read the following statement and sign below:

I understand that I am not allowed to use the internet to search for problems or solutions. I also understand that I must write down the final version of my assignment without reference to notes copied from anyone else's speech or written text. I pledge to abide by the Williams honor code.

SIGNATURE:_____

Problem Set 7

7.1 Let V be a vector space.

(a) Given $\vec{v} \in V$, prove that $\vec{v}$ has a unique additive inverse.

(b) Prove that $-1 \cdot \vec{v} = -\vec{v}$.

7.2 Problem **2.2** from Chapter 1 of the textbook. (Of course, you must justify your answers with proof or counterexample.)

7.3 Let $M_{2\times 2}(\mathbb{R})$ denote the space of 2×2 matrices with real entries. What is the dimension of $M_{2\times 2}(\mathbb{R})$? Prove it. [*Hint: First find a basis. Then prove it's a basis. This gives you the dimension.*]

7.4 Recall that a magic square is a square array of numbers such that each row, each column, and the two main diagonals have the same sum. In class we saw two examples of 3×3 magic squares:

1	1	1
1	1	1
1	1	1

8	1	6
3	5	7
4	9	2

(a) The square on the above right uses each of the numbers from 1 to 9 exactly once. Determine all 3×3 magic squares with this property. Prove that you've found all of them. [*Hint: what can you say about the central square?*]

(b) Let $MSS_n(\mathbb{R})$ denote the vector space of $n \times n$ magic squares with real entries. What is the dimension of $MSS_2(\mathbb{R})$? Prove it.

(c) What is the dimension of $MSS_3(\mathbb{R})$? Prove it.