L	A	S	T		N	A	M	E						,	F	I	R	S	T		N	A	M	E	

Cover Sheet for 2014-2015 Fall Semester MATH 3200/5200 (Barsamian) Homework 3
(Due at the start of class Monday, September 22, 2014. Staple this cover sheet to the front of your work.)

Problem:	1	2	3	4	5	Total	Rescaled
Your Score:							
Possible:	20	20	20	20	20	100	10

Reading: In Chapter Two, read Sections I.1, pages 77 - 86 and I.2, pages 90 - 97

Suggested Exercises: (These nineteen exercises are not to be turned in and are not graded, but you should do as many of them as possible and keep your solutions in a notebook for study. Note that detailed solutions to all of the Suggested Exercises are available in the solutions manual provided for free on the author's web site.)

Section Two.I.1 Exercises # 19, 20, 21, 22, 24, 29, 32, 37 (from pages 86 - 90)
Section Two.I.2 Exercises # 20, 21, 22, 25, 26, 27, 28, 30, 31, 39, 43 (from pages 97 - 101)

Assigned Exercises: Turn in your solutions to the following five exercises, with this cover sheet stapled to the front of your work.

Exercises using Section Two.I.1 Concepts:

[1] Let $S = \left\{ \begin{pmatrix} x \\ y \\ z \end{pmatrix} \in \mathbb{R}^3 | x + 2y - 3z = 0 \right\}$. Show that S is a vector space.
(Use only Section Two.I.1 concepts. That is, prove that each of the ten vector space conditions is satisfied.)

[2] Is the set $\mathbb{Z}$ of integers a vector space over $\mathbb{R}$ under the usual addition and scalar multiplication operations?

- If you say that it is, then prove that each of the ten vector space conditions is satisfied.
- If you say that it is not, then explain which vector space conditions are not satisfied.

[3] Let $S = \{f: \mathbb{R} \to \mathbb{R} | f(5) = 0\}$. That is, S is the set of real-valued functions f of one real variable that have the property that $f(5) = 0$.
Define an operation of function addition as follows:

- For two functions f, g the symbol $f + g$ denotes the function defined by $(f + g)(x) = f(x) + g(x)$.

And define an operation of scalar multiplication by real numbers as follows

- For a function f and a real number r the symbol $r \cdot f$ denotes the function defined by $(r \cdot f)(x) = rf(x)$.)

With the operations of function addition and scalar multiplication by real numbers, is the set S a vector space?

- If you say that it is, then prove that each of the ten vector space conditions is satisfied.
- If you say that it is not, then explain which vector space conditions are not satisfied.

Exercises using Section Two.I.2 Concepts:

[4] Let V be the vector space of 2×2 matrices with real entries, with operations of matrix addition and scalar multiplication by real numbers. Let $S = \left\{ \begin{pmatrix} a & b \\ b & a \end{pmatrix} | a, b \in \mathbb{R} \right\}$. This set S is called the *symmetric* 2×2 matrices. The set S is a subset of V, so it inherits the operations of addtion and scalar multiplication by real numbers. Is set S a subspace? Explain clearly.

[5] The *odd* functions are defined as the set $Odd = \{f: \mathbb{R} \to \mathbb{R} | f(-x) = -f(x)\}$. This is a subset of the set of all real-valued functions, and so it inherits the operations of function addition and scalar multiplication by real numbers. (Those operations were defined above in problem [3].) Is the subset Odd a subspace? Explain clearly. (Your explanation will need more detail than the book's answer to a similar question.)