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University of Ottawa

Department of Mathematics and Statistics

MAT 1341: Introduction to Linear Algebra

Instructor: Erhard Neher

Assignment 2; due June 18, 2008, 18:00 in the class room

Family Name: _____

First Name: _____

Student number: _____

Please read these instructions carefully:

- The table below is for the TA. Do not write in the table.
- The assignment has to be submitted with the two cover pages. You may or may not use the pages 3-7 of this copy.
- For privacy reasons, this page of the assignment will be detached, and you will only get back the remaining pages of the assignment. Therefore, **fill in your name on both pages and your student number on this page only.**

Quest.	1.	2.	3.	4.	5.	Total
maximal	6	4	6	6	3 + 3 extra	25
score						

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Please read these instructions carefully:

- All questions require justification, written legibly and logically: You must convince the TA and me that you know why your solution is correct. Correct answers without justification will get 0 marks.
- You have to submit this assignment at the beginning of the class on Wednesday, June 18, 2008, at 18:00 in the classroom at the latest. If you wish to submit it earlier, please do so at the secretariat of the Department of Mathematics, room 103A, 8:45–12:00 and 13:00–16:00.

Good luck! Bonne Chance!

1. Which of the following sets is linearly independent? If the set is dependent, give an example of a nontrivial linear combination that equals zero. Yo must justify your answer.

(a) **(3 points)** $\{[1 \quad 6]^T, [-3 \quad 5]^T\}$

(b) **(3 points)** $\{[1 \quad -1 \quad 0]^T, [3 \quad 2 \quad -1]^T, [5 \quad 0 \quad -1]^T\}$.

2. (a) **(3 points)** Verify that the given vectors span $\mathbb{R}^3$:

$$[-5 \quad -2 \quad -2]^T, [7 \quad -9 \quad 3]^T, [4 \quad -8 \quad 9]^T, [8 \quad 4 \quad 7]^T.$$

(b) **(1 point)** Do the vectors form a basis of $\mathbb{R}^3$?

3. (6 points) Show that $U = \{[\,3a+4b \quad 7a-b \quad a+b \quad -3b\,]^T \in \mathbb{R}^4 : a, b \in \mathbb{R}\}$ is a subspace of $\mathbb{R}^4$. Find a basis and $\dim U$.

4. (6 points) Find a basis and the dimension of $nullA$ where

$$A = \begin{bmatrix} 2 & 3 & -3 & 7 & -1 \\ 2 & 0 & 2 & 4 & -5 \end{bmatrix}.$$

5. Let U and V be any subspaces of $\mathbb{R}^n$.

(a) **(3 points)** Show that $U \cap V = \{x \in \mathbb{R}^n : x \in U \text{ and } x \in V\}$ is a subspace of $\mathbb{R}^n$.

(b) (**3 extra points**) Show that $U + V = \{X \in \mathbb{R}^n : X = X_U + X_V \text{ for some } X_U \in U \text{ and some } X_V \in V\}$ is also a subspace of $\mathbb{R}^n$.