Page 1

University of Ottawa
Department of Mathematics and Statistics

MAT 1341C: Introduction to Linear Algebra
Instructor: Erhard Neher

Assignment 1: due Jan. 29, 2009, 11:30 in the classroom

Family name (CAPITALS)	
First name (CAPITALS)	
Signature	
Student number	

Please read these instructions carefully:

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

Question	1	2	3	4	Total
Score					
Max. score	4	4	6	8	22

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Good luck! Bonne chance!

(1) (a) (2 pts) Find the matrix A that satisfies the following equation:

$$iA - \begin{bmatrix} i & 0 & 1 \\ 1 & 1 & -i \end{bmatrix}^T = \begin{bmatrix} 0 & i \\ 3 & 2 \\ i & 1 \end{bmatrix}.$$

(b) (2 pts) Find the rank of the matrix

$$\begin{bmatrix} 1 & -3 & 2 & -4 \\ -3 & 9 & -1 & 5 \\ 2 & -6 & 4 & -3 \\ -4 & 12 & 2 & 7 \end{bmatrix}.$$

(2) In each case either show that the statement is true or give an example with concrete numbers showing that it is false. Assume that a linear system is given with augmented matrix A and coefficient matrix C.

(a) (1 pts) If the system has a solution then $\text{rank}(A) = 1 + \text{rank}(C)$.

(b) (1 pts) If there are more variables than equations, the system is consistent.

(c) (1 pts) If the system is homogeneuos,has 4 equations, 6 variables, and $\text{rank}(A) = 3$, there are 3 parameters.

(d) (1 pts) If A is 6×7 and $\text{rank}(A) = 6$, the system has only the trivial solution.

(3) (6 pts) **In this problem, replace α by the last digit of your student number.** Your doctor has asked you to take every day $\alpha+8$ units of vitamin A, $17+3\alpha$ units of vitamin B and 7 units of vitamin C. There are three brands available in your local pharmacy which contain the following units of vitamins A, B, C as indicated.

	vitamin A	vitamin B	vitamin C
Brand 1	1	2	1
Brand 2	1	3	0
Brand 3	3	7	2

(a) (5 pts) Find all combination of pills that provide you with the exact daily requirement (no partial pills!).

(b) (1 pts) If all brands cost \$1, find the least expensive treatment and its cost.

(4) (6+2 pts) Consider the following system of linear equations:

$$\begin{array}{rcrcrcl} x & - & 3y & + & 5z & = & 7 \\ x & + & (a-3)y & + & 7z & = & 8 \\ x & - & 3y & + & (a^2+2a+5)z & = & a+7 \end{array}$$

(a) Determine the values of a for which the system has:

(i) no solution

(ii) infinitely many solutions

(iii) exactly one solution.

(b) In case (ii), describe the solution set of the system.