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University of Ottawa
Department of Mathematics and Statistics

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

Assignment 2: due Feb. 26, 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	5	6	7	Total
Score								
Max. score	2	3	2	2	4	5	4	22

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Good luck! Bonne chance !

(1) (2 pts) Calculate the determinant

$$\begin{vmatrix} 1 & 1 & 2 & 8 & 0 & 0 \\ 0 & 1 & 0 & -3 & 0 & 0 \\ 13 & -8 & 2 & 2 & 1 & 7 \\ 5 & 5 & -5 & 2 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 3 & 1 & 4 & 3 & 0 & 0 \end{vmatrix}$$

without using any elementary operation by choosing at each step an appropriate column or row. Show your calculations.

(2) (3 pts) Calculate the determinant $\begin{vmatrix} 2 & -3 & 1 & 4 \\ 12 & -5 & 11 & 3 \\ 7 & 6 & -9 & 4 \\ 2 & -7 & 6 & 9 \end{vmatrix}$.

Any correct method is allowed. Show all details.

(3) (2 pts) If A is a square matrix such that $\det(A) = 5$ and $\det(-2A) = 80$, what is the size of A?

My answer:_____

Details:

(4) (2 pts) A student performs the following row operations on a 4×4 matrix A:

$$A = \begin{pmatrix} R_1 \\ \hline R_2 \\ \hline R_3 \\ \hline R_4 \end{pmatrix} \rightsquigarrow \begin{pmatrix} R_4 \\ \hline R_1 - 3R_2 \\ \hline 2R_3 \\ \hline R_1 \end{pmatrix} = A'$$

If $\det(A') = 5$, what is $\det(A)$? Show all details.

My answer:_____

Details:

(5) (4 pts) Let A and B be two square matrices of the same size such that

$$\det(A^2B^T) = 250 \quad \text{and} \quad \det(A^TB^2) = -1/2.$$

What are the determinants of A and B? Show your calculations.

My answer:_____

Details:

(6) (5 pts) Are the following subspaces? Support your answer with details.

(a) $U_1 = \{X \in \mathbb{R}^n : AX = 3X\}$.

My answer:_____

Details:

(b) $U_2 = \{X = \begin{bmatrix} x & y & z \end{bmatrix}^T \in \mathbb{R}^3 : x + 2y + 3z = \alpha\}$, where α is the last digit of your student number.

My answer:_____

Details:

(c) We fix a non-zero vector $d \in \mathbb{R}^3$, and define $U_3 = \{X \in \mathbb{R}^3 : \text{proj}_d(X) = 0\}$, where $\text{proj}_d(X)$ is the projection of X onto d.

My answer:_____

Details:

(7) (4 pts) Determine α and β such that

$$\begin{bmatrix} 2 \\ 1 \\ \beta \end{bmatrix} \quad \text{lies in the span of } X_1 = \begin{bmatrix} 1 \\ 1 \\ 4 \end{bmatrix}, X_2 = \begin{bmatrix} 1 \\ 2 \\ 5 \end{bmatrix}, X_3 = \begin{bmatrix} 1 \\ 3 \\ \alpha \end{bmatrix}.$$