The University of Manitoba

Vector Geometry and Linear Algebra (MATH 1300)

Midterm Examination: Winter 2009

February 24, 2009.

Time: One hour | Total Marks: 60

Last Name (CAPITAL LETTERS ONLY): _____

Student Number: _____

First Name (CAPITAL LETTERS ONLY): _____

Signature: _____

(I acknowledge that cheating is an extremely serious offense.)

Place a check mark (✓) in the box corresponding to your section.

☐	D. Kelly	A01	T-Th 10-11:15
☐	M. Doob	A02	M-W-F 1:30-2:20
☐	J. Chipalkatti	A03	M-W-F 3:30-4:20
☐	J. Arino	A04	T-Th 4:00-5:15

Instructions:
Please ensure that your paper has a total of 4 pages (including this page). Read the questions thoroughly and carefully before attempting them. You must **show your work** in reasonable detail to get credit.

You are **not allowed** to use any of the following: calculators, notes, books, dictionaries or electronic communication devices (e.g., cellular phones, pagers or blackberries). You may use the left-hand pages for rough work.

	Obtained	Maximum
Q1		12
Q2		6
Q3		10
Q4		6
Q5		8
Q6		10
Q7		8
Total		**60**

Q1. Let $A = \begin{bmatrix} -1 & 0 & 1 \\ 0 & 1 & 0 \\ 2 & 3 & -1 \end{bmatrix}$. Find the inverse of A using elementary row operations. (Hint: there are no fractions in A^{-1}.) [12]

Q2. Let A, B and C be matrices such that A has size 5×7. Assume that the matrix $AB^{-1} + C^T B$ is defined. What are the sizes of B and C ? [6]

Answers: The size of B is _____ The size of C is _____

Q3. Let $A = \begin{bmatrix} -4 & 3 \\ 1 & 0 \end{bmatrix}$. Find 2×2 elementary matrices E_1, E_2 and E_3 such that $A = E_1 E_2 E_3$. [10]

Q4. Assume that the matrix [6]

$$\begin{bmatrix} 1 & a-2b+7 & b+2 & 2a-6 \\ 0 & 1 & a+4b & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

is in reduced row-echelon form. Find the values of a and b.

Answers: $a =$ _____ $b =$ _____

Q5. Let $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 3 & x-1 \\ 0 & 2 & -5 \end{bmatrix}$. If $\det(-2A) = 88$, then find the value of x. [8]

Answer: $x =$ _____

Q6. Consider the following system of linear equations: [10]

$$2x + y = 1, \quad x - 4y = 14.$$

Find the values of x and y using Cramer's rule. No credit will be given for any other method.

Answers: $x =$ _____ $y =$ _____

Q7. Let $A = \begin{bmatrix} -3 & 2 & 1 \\ 4 & 7 & -2 \\ 1 & 3 & -1 \end{bmatrix}$. Find the entry in the 3rd row and 2nd column of A^{-1}.

(Hint: use the formula for A^{-1} in terms of $\mathrm{adj}(A)$.) [8]

Answer: The entry is = _____