University of Lethbridge
Department of Mathematics and Computer Science
11^{th} February, 2015, 10:00 - 10:50 am

MATH 1410A - Test #1

Last Name:____

First Name:____

Student Number:____________________________________

Tutorial Section: ____________________________________

Record your answers below each question in the space provided. Left-hand pages may be used as scrap paper for rough work. If you want any work on the left-hand pages to be graded, please indicate so on the right-hand page.

Partial credit will be awarded for partially correct work, so be sure to show your work, and include all necessary justifications needed to support your arguments.

No external aids are allowed, with the exception of a 5-function calculator.

For grader's use only:

Page	Grade
2	/10
3	/10
4	/10
5	/10
Total	/40

A

1. SHORT ANSWER: For each of the questions below, please provide a short (one line) answer.

[2] (a) What is the rank of a matrix?

[2] (b) What does it mean to say that an $n \times n$ matrix A is invertible?

[2] (c) The matrix $E = \begin{bmatrix} 1 & 0 & -3 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ is an elementary matrix. If A is any other 3×3 matrix, what elementary row operation would let us obtain EA from A?

[2] (d) Do the values $x = 3$, $y = -2$, $z = 4$ provide a solution to the system of equations below? Why or why not?

$$\begin{array}{rcrcrcr} x & + & y & + & z & = & 5 \\ 2x & + & 4y & - & z & = & -6 \\ -3x & - & 5y & + & z & = & 3 \end{array}$$

[2] (e) Identify the matrices below as symmetric, antisymmetric, or neither:

$$\begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix} \qquad \begin{bmatrix} 0 & 4 \\ -4 & 0 \end{bmatrix} \qquad \begin{bmatrix} 1 & 2 \\ 2 & -3 \end{bmatrix}$$

[10] 2. Find the general solution to the following system of linear equations:

$$\begin{array}{rcrcrcrcl} x & - & 2y & & & + & w & = & 0 \\ & & -y & + & 2z & - & w & = & 1 \\ x & - & 3y & + & 2z & & & = & 1 \end{array}$$

3. Suppose A, B, and X are 2×2 matrices.

[3] (a) Given that $3A + X^T = B$, solve for X in terms of A and B.

[3] (b) If $A = \begin{bmatrix} 1 & -2 \\ 4 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 2 \\ 3 & 0 \end{bmatrix}$ and X is as in part (a), determine the entries of X.

[4] 4. Suppose that A, B, C, and D are $n \times n$ matrices, with A, B, and C *invertible*. Given that

$$AB^{-1}XBC^T = AD,$$

solve for X in terms of A, B, C, and D.

5. Let $A = \begin{bmatrix} 2 & -4 \\ -4 & 9 \end{bmatrix}$.

[5] (a) Find A^{-1}.

[3] (b) Write A^{-1} as a product of elementary matrices.

[2] (c) Write A as a product of elementary matrices.

 Total Points: 40