

UNIVERSITY OF MANITOBA

DATE: March 18, 2015

TERM TEST 2

TITLE PAGE

EXAMINATION: Techniques of Classical and Linear Algebra

TIME: 60 minutes

COURSE: MATH 1210

EXAMINER: various

FAMILY NAME (Write in Capital Letters): _____

GIVEN NAME (Write in Capital Letters): _____

STUDENT NUMBER: _____

SIGNATURE: (in ink) _____

(I understand that cheating is a serious offense.)

- A01 9:30–10:20 AM MWF (207 Buller) Dr. R. Padmanabhan
- A02 1:30–2:20 PM MWF (206 Human Ecology) Dr. N. Harland
- A03 9:30–10:20 AM MWF (205 Armes) Dr. J. Chipalkatti

INSTRUCTIONS TO STUDENTS:

This is a 60 minute exam. **Please show your work clearly.**

No texts, notes, or other aids are permitted. There are no calculators, cellphones or electronic translators permitted.

This exam has a title page and 4 pages of questions. **DO NOT REMOVE ANY PAGES OR THE STAPLE.**

The value of each question is indicated in the left hand margin beside the statement of the question. The total value of all questions is 50 points.

Answer all questions on the exam paper in the space provided beneath the question. If you need more room, you may continue your work on the reverse side of the page, but **CLEARLY INDICATE** that your work is continued. You may use the back of the pages for scrap work, but be **very clear** if you want it marked.

Question	Points	Score
1	6	
2	7	
3	8	
4	6	
5	7	
6	6	
7	10	
Total:	50	

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- [6] 1. Consider the lines L_1 and L_2 given by the symmetric equations:

$$L_1 : \frac{x-1}{2} = \frac{y+1}{-1} = \frac{z}{4}, \quad \text{and } L_2 : \frac{x+1}{1} = \frac{y-3}{-2} = \frac{z-2}{-1}.$$

Determine whether L_1 and L_2 intersect each other. If they do, then find their point of intersection.

- [7] 2. Find an equation of the plane which is perpendicular to the line

$$x = -t + 1, \quad y = 3t - 4, \quad z = 5t - 2,$$

and passes through the point $P = (6, -1, 8)$.

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- [8] 3. Use Gaussian Elimination to solve the linear system below. No credit will be given for any other method.

$$x - 2y + 4z + w = 7$$

$$2x - 4y - 6z + 2w = -12$$

$$-x + 2y + 10z - w = 25$$

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- [6] 4. It is given to you that the matrix

$$A = \begin{bmatrix} 1 & 2a - b & a - 2 \\ 0 & a + 2b & 1 \\ 0 & 0 & 0 \end{bmatrix}$$

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

- [7] 5. The augmented matrix of a linear system with variables (x_1, x_2, \dots, x_7) has the following reduced row-echelon form (RREF).

$$\left[\begin{array}{cccccc|c} 0 & 1 & 2 & 0 & 0 & 3 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 4 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & -5 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \end{array} \right]$$

Find basic solutions for the linear system.

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- [6] 6. Is the following true or false? If A is a 5×5 matrix such that $A^T = -A$, then $\det(A) = 0$. Justify your answer completely.

- [10] 7. Use Cramer's Rule to calculate the **z value** of the linear system given below. No credit will be given for any other method.

$$x - y + 4z = 7$$

$$x + 3y - 6z = -13$$

$$2x - 2y - 4z = -10$$