

UNIVERSITY OF REGINA  
DEPARTMENT OF MATHEMATICS AND STATISTICS  
Math122–001 Linear Algebra I  
Sample Test 1

*Answer all the questions  
Time: 45 minutes*

**Family name:** \_\_\_\_\_ **First name:** \_\_\_\_\_

**Student ID:** \_\_\_\_\_

Question:	1	2	3	4	5	6	Total
Marks available:	2	3	3	3	7	7	25
Marks:							

**READ THESE INSTRUCTIONS CAREFULLY**

1. This test has 6 questions.
2. You have 45 minutes to complete this test.
3. This is a closed book test, and no notes of any kind are allowed. The use of cell phones, pagers, or any text storage or communication device is not permitted. **Please turn off your cell phones!**
4. Calculators are permitted, but are strongly discouraged: no questions require the use of a calculator.
5. Please show all of your work. It is *your* responsibility to convince me that you know what you are doing! Clarity, completeness, and organization are important.
6. Where it is possible to check your work, do so.
7. Use the backs of the pages if you need extra space.
8. Good luck!

**DO NOT OPEN THIS BOOKLET  
UNTIL YOU HAVE BEEN  
TOLD TO DO SO**

1. Find a vector in  $\mathbb{R}^3$  that is orthogonal to both  $\mathbf{u} = (1, 0, -2)$  and  $\mathbf{v} = (2, 2, 5)$ .

*(2 marks)*

2. Find the equation of the plane in  $\mathbb{R}^3$  that contains the points  $P(1, 2, 3)$ ,  $Q(1, 1, 1)$  and  $R(2, 0, -1)$ .

*(3 marks)*

**TURN OVER**

3. Find the parametric equation of the line in  $\mathbb{R}^3$  that passes through the point  $P(1, -2, 3)$  and is orthogonal to the plane  $2x - 3y + z = 6$ .

*(3 marks)*

4. Find the intersection of the plane given by  $2x - y - 2z = 2$  and the line with the parametric equation

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

*(3 marks)*

**TURN OVER**

5. Consider the following system of linear equations:

$$\begin{aligned}y - z + w &= 1 \\x + y + w &= 2 \\2x + 2y + 4z + 2w &= 4\end{aligned}$$

(a) Put the augmented matrix of this system into reduced row-echelon form.

*(4 marks)*

(b) Give the general solution to this system.

*(2 marks)*

(c) Check that your solution satisfies the first equation.

*(1 mark)*

**TURN OVER**

6. Consider the following three matrices:

$$A = \begin{bmatrix} 1 & 1 \\ 2 & -1 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & 0 & -1 \\ 3 & -1 & 4 \end{bmatrix}, \quad C = \begin{bmatrix} 2 & 1 \\ 4 & 0 \end{bmatrix}.$$

Either calculate the following, or briefly explain why this is impossible.

(a)  $A + B$

*(1 mark)*

(b)  $2A - C$

*(2 marks)*

(c)  $AB$

*(2 marks)*

(d)  $BC$

*(2 marks)*

**END OF QUESTIONS**

*R. F. Bailey, 2 February 2012*