CURTIN UNIVERSITY

Discipline of Mathematics and Statistics

**MATH1015 Linear Algebra 1**

**MID-SEMESTER TEST**

**Semester 1, 2021**

**INSTRUCTIONS:** Answer all questions in the spaces provided.

To obtain full marks for a question you must **clearly** show appropriate working.

**TIME ALLOWED:** 1 hour.

**TOTAL MARKS:** 50

**AIDS ALLOWED:** 1. Scientific Calculator.

1. A4 Sheet of handwritten or typed notes (both sides).

Last Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Given Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Student Number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Tutor’s Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Workshop Day: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Workshop Time: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Declaration**: *I hereby undertake not to discuss or divulge the content or format of the test paper with any other person until all tests have been written, and declare that I have no prior knowledge of the contents of the test paper.*

*I unconditionally accept any action that may be taken should Curtin University consider that an infringement of the statute No. 10 of the Student Disciplinary Statute has occurred.*

**Signature**: **Date**: / / 2021

**Question 1**

Given the points and , and the vectors , ,and

1. Determine the position vector of the point . (1 mark)
2. Find the vector from point to point . (2 marks)
3. Express the vector in terms of the standard unit basis vectors. (1 mark)
4. Determine the vector twice the length of which is also in the opposite direction to . (2 marks)
5. Find a non-zero vector perpendicular to . (2 marks)

*Question 1 is continued on the next page…*

**Question 1 continued**

Given the points and , and the vectors , ,and

1. Determine the value of that makes parallel to . (2 marks)
2. Determine the vector projection of onto . (3 marks)
3. Find a non-zero vector orthogonal to both and . (3 marks)

*Question 2 is on the next page…*

**Question 2**

Given the matrices,

,

Find, if possible the following. If it’s not possible then explain why.

1. (2 marks)
2. (3 marks)
3. (3 marks)
4. (2 marks)

*Question 3 is on the next page…*

**Question 3**

Given the following system of linear equations,

1. Find the augmented matrix of the system. (2 marks)
2. By using elementary row operations reduce the augmented matrix into row echelon form. (3 marks)
3. Using your result from (ii) determine the value of for which the system has no solution. (1 mark)

*Question 4 is on the next page…*

**Question 4**

Given the following augmented matrix , which is in row echelon form, the underlying system of linear equations has an infinite amount of solutions. Determine these infinite solutions (make sure you state the rank of , the rank of , the number of variables, as well as the number of parameters required to describe the infinite solutions).

(8 marks)

*Question 5 is on the next page…*

**Question 5**

Solve the follow system of linear equations by using the Gauss Jordan method to manipulate the augmented matrix into reduced row echelon form,

(10 marks)

*~END OF TEST~*

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