Tutorial Quiz 2018

# MATH1013 - Mathematics and Applications 1

Tutorial Quiz 4 Calculus and Linear Algebra

> Reading time: 1 minute Writing time: 10 minutes

Student Name: \_\_\_\_\_\_ University ID: \_\_\_\_\_\_

### Question and Answer Book

#### Structure of Book

Number of	Number of questions	Number of
questions	to be answered	marks
2	2	10

- Students are NOT permitted any calculators or notes during the quiz.
- Students are NOT permitted to colaborate in any form during the quiz. Any signs of collaboration or cheating will result in a nullified score and the course convenor will be informed of any academic misconduct.

#### Materials supplied

- Question and answer booklet of 5 pages.
- Working space is provided throughout the booklet.

#### Instructions

- Write your **student number** in the space provided above on this page.
- All written responses must be in English.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

#### Intructions

Answer **all** questions in the space provided.

In all questions where a numerical answer is required, an exact value must be given unless otherwise specified.

In questions where more than one mark is available, appropriate working **must** be shown. Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

### Linear Algebra

### Question 1

Let  $T: \mathbb{R}^3 \to \mathbb{R}^3$  be the function defined by  $T(\mathbf{v}) = A\mathbf{v}$ , where

$$A = \begin{bmatrix} 1 & 3 & 4 \\ 2 & 1 & 3 \\ 1 & 6 & 0 \end{bmatrix}.$$

a. Determine whether the vectors formed from the columns of A are linearly independent. [3 marks].

b. Hence, or otherwise, determine whether the vectors formed from the columns of A span  $\mathbb{R}^3$ . Justify your answer. [1 mark].

Turn Over.

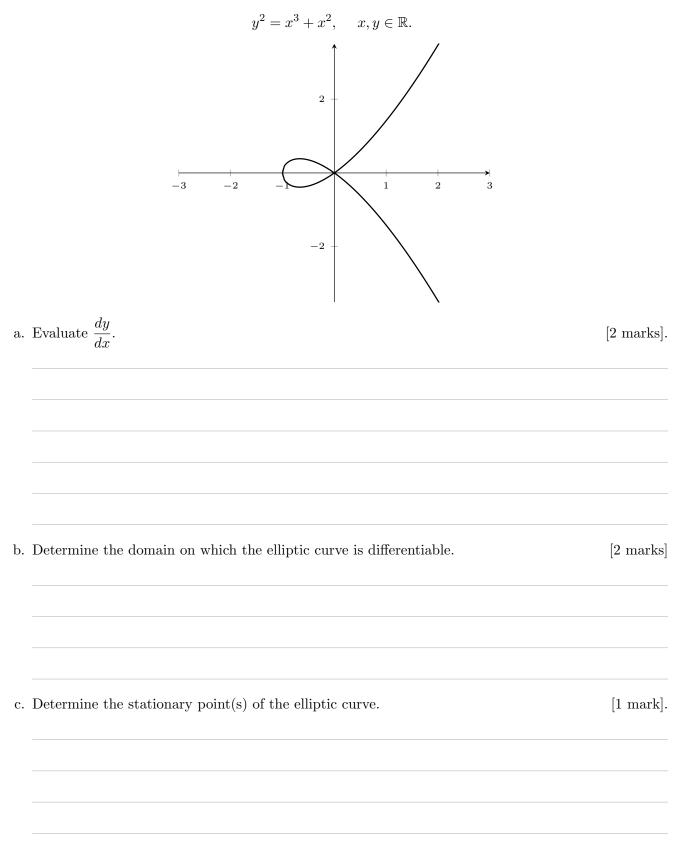
c. Suppose we now extend T to be a function defined on  $\mathbb{R}^5$ . That is, we have a new function  $\widetilde{T} : \mathbb{R}^5 \to \mathbb{R}^3$  which agrees with T when restricted to  $\mathbb{R}^3$ . Determine, with justification, the dimension of the matrix A, where  $\widetilde{T}(\mathbf{v}) = A\mathbf{v}$ . [1 mark].

Turn Over.

## Calculus

### Question 1

The diagram below shows the graph of the elliptic curve



### END OF TUTORIAL QUIZ