Tutorial Quiz 2018

MATH1013 - Mathematics and Applications 1

Tutorial Quiz 2
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 questions	Number of questions to be answered	Number of 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.

Linear Algebra

Question 1

Let $v_1, v_2, v_3 \in \mathbb{R}^3$ be the vectors defined by

$$v_1 = \begin{bmatrix} 1 \\ 2 \\ 0 \end{bmatrix}, \quad v_2 = \begin{bmatrix} -2 \\ 1 \\ -1 \end{bmatrix}, \quad v_3 = \begin{bmatrix} 1 \\ 3 \\ 1 \end{bmatrix}.$$

a. Define what it means for a set of vectors $\{u_1, ..., u_n\}$ in $\mathbb{R}^n$ to be linearly independent.

[This is independent of the above information].

[1 mark]

b. Determine whether the vectors $v_1, v_2, v_3 \in \mathbb{R}^3$ given above, are linearly independent.

[3 marks]

Turn over

c. Hence, or otherwise, determine whether the vectors v_1, v_2, v_3 span $\mathbb{R}^3$.

[1 mark]

Calculus

Question 1

Let $f : \mathbb{R} \to \mathbb{R}$ be the function defined by

$$f(x) = \begin{cases} x^2 \exp\left(\sin\left(\frac{1}{x}\right)\right), & x \in \mathbb{R}\backslash\{0\}, \\ 0, & \text{otherwise,} \end{cases}$$

where we have adopted the notation $\exp(x) := e^x$.

a. Define what it means for a function $g : \mathbb{R} \to \mathbb{R}$ to be continuous.

   [This is independent of the above information.]

[1 mark].

b. Evaluate the limit

$$\lim_{x \to 0} f(x),$$

   where f is defined above.

[3 marks].

Turn over

c. Hence, or otherwise, determine whether f is a continuous function.

[1 mark].

END OF TUTORIAL QUIZ.