Tutorial Quiz 2018

MATH1014 - Mathematics and Applications 2

Tutorial Quiz 1 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
3	3	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 4 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.

Instructions

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.

Question 1

Let **u** and **v** be two vector in \mathbb{R}^2 . Suppose that $\mathbf{u} = 3\mathbf{i} - 2\mathbf{j}$ and $\mathbf{v} = -\mathbf{i} + 5\mathbf{j}$.

a) Calculate $\mathbf{u} \cdot \mathbf{v}$, where \cdot denotes the standard dot product of	on \mathbb{R}^2 . [2 marks].
o) Is \mathbf{u} orthogonal ¹ to \mathbf{v} ?	[1 mark]

¹Recall that orthogonal is equivalent to perpendicular.

Question 2

Let $\mathbf{v} \in \mathbb{R}^3$ denote the vector $\mathbf{v} = 2\mathbf{i} + \mathbf{j} - 3\mathbf{k}$.

(a)	Determine a vector $\mathbf{u} \in \mathbb{R}^3$ which is orthogonal to \mathbf{v} .	[2 marks].
(-)		
(b)	Is the vector \mathbf{u} determined in part (a) unique? Justify your answer.	[1 mark].

Question 3

Consider the following vector $\mathbf{r}(t) \in \mathbb{R}^3$ which is parameterised by time $t \in \mathbb{R}_{\geq 0}$,

$$\mathbf{r}(t) = \cos t\mathbf{i} + \sin t\mathbf{j}.$$

(a)	Evaluate $\mathbf{r}'(t)$. Here $\mathbf{r}'(t)$ denotes the vector whose components are given by the derived components of $\mathbf{r}(t)$.	vatives of the [2 marks].
(b)	Show that $\mathbf{r}(t)$ and $\mathbf{r}'(t)$ are orthogonal.	[2 marks].
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END OF TUTORIAL QUIZ.