Tutorial Quiz 2018

MATH1014 - Mathematics and Applications 2

Tutorial Quiz 8
Calculus and Linear Algebra

Reading time: 1 minute
Writing time: 8 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.

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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

For each statement, decide whether it is always true (**T**) or sometimes false (**F**) and write your answer clearly next to the letter before the statement.

(a) A 3×3 upper triangular matrix which has diagonal entries 1, 2, 7, is always diagonalisable.

(b) If the eigenvalues of a 3×3 matrix are 1, 1, 2, then A is invertible.

(c) If the eigenvalues of a 3×3 matrix are 1, 1, 2, then A is diagonalisable.

(d) Suppose that the only eigenvectors of A are multiples $x = (1, 0, 0)$, then A is not invertible.

(e) Let A and B be two $n \times n$ matrices, where $n \in \mathbb{N}$. If λ_1 is an eigenvalue of A, and λ_2 is an eigenvalue of B then $\lambda_1 \cdot \lambda_2$ is an eigenvalue of AB.

Question 2

Consider the matrices

$$A_1 := \begin{bmatrix} 2 & -2 \\ 2 & -2 \end{bmatrix}, \qquad A_2 := \begin{bmatrix} 2 & 0 \\ 2 & -2 \end{bmatrix}, \qquad \text{and} \qquad A_3 := \begin{bmatrix} 2 & 0 \\ 2 & 2 \end{bmatrix}.$$

Determine (**with jufistication**) which of these of these matrices is diagonalisable. If the matrix is diagonalisable, write out the matrices $\Lambda D \Lambda^{-1}$ such that $A = \Lambda D \Lambda^{-1}$. Here we have adopted the standard notation that Λ represents an invertible matrix, and D is a diagonal matrix.

END OF TUTORIAL QUIZ