

Tutorial Quiz 2018

MATH1014 - Mathematics and Applications 2

Tutorial Quiz 9 Calculus and Linear Algebra

Reading time: 1 minute
Writing time: 12 minutes

Student Name: _____
University ID: _____

Question and Answer Book

Structure of Book

<i>Number of questions</i>	<i>Number of questions to be answered</i>	<i>Number of marks</i>
3	3	15

- Students are NOT permitted any calculators or notes during the quiz.
- Students are NOT permitted to collaborate 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

(6 marks). 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) Suppose that A is a diagonal matrix. Then A is similar to a diagonal matrix.
- (b) Every change of basis matrix is invertible.
- (c) A matrix is invertible if and only if it has an eigenvalue of 0.
- (d) All invertible matrices are diagonalisable.
- (e) Suppose that A is an $n \times n$ invertible matrix. Then A has n distinct eigenvalues $\lambda_1, \dots, \lambda_n$.
- (f) If A is diagonalisable, then A^T is diagonalisable.

Question 2

(6 marks). 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) If A is a square matrix and $A\mathbf{v} = \lambda\mathbf{v}$ for some non-zero scalar λ , then \mathbf{v} is an eigenvector of A .
- (b) If λ is an eigenvalue of the matrix A , then the linear system $(\lambda I - A)\mathbf{v} = \mathbf{0}$ has only the trivial solution.
- (c) If the characteristic polynomial of a matrix A is $p(\lambda) = \lambda^2 + 1$, then A is invertible.
- (d) If λ is an eigenvalue of a matrix A , then the eigenspace of A corresponding to λ is the set of eigenvectors of A corresponding to λ .
- (e) The eigenvalues of a matrix A are the same as the eigenvalues of the reduced row echelon form of A .
- (f) If 0 is an eigenvalue of a matrix A , then the set of columns of A is linearly independent.

Question 3

(3 marks). Let A be an $n \times n$ matrix with real entries. Suppose that A has an eigenvalues $\lambda \in \mathbb{R} \setminus \{0\}$. Show that $\frac{1}{\lambda}$ is an eigenvalue of A^{-1} .

END OF TUTORIAL QUIZ