

MA 102: Linear Algebra
Quiz 2 — Determinants & Eigenvalues

Duration: 30 minutes Maximum marks: 12

SET A

Name: _____ Roll No.: _____

Instructions

- Write your name and roll number before starting.
- This paper has 6 questions in 3 parts, for a total of 12 marks.

Part A — Multiple Choice

6 marks

- Q1.** What is the rank of the 3×3 matrix of all ones, $\begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$? *[2 marks]*
- (A) 0
(B) 2
(C) 1
(D) 3
- Q2.** For a square real matrix A , which conditions are **equivalent** to invertibility? (*Select all that apply.*) *[2 marks]*
- (A) A has full rank
(B) $\det A \neq 0$
(C) A is symmetric
(D) A is diagonalizable
- Q3.** Compute $\det \begin{pmatrix} 2 & 1 \\ 3 & 4 \end{pmatrix}$. *[2 marks]*
- (A) 5
(B) 8
(C) -5
(D) 11

Part B — Fill in the Blanks

2 marks

- Q4.** A nonzero vector v is an eigenvector of A when $Av = \underline{\hspace{2cm}} v$ for some scalar. *[1 mark]*
- Q5.** For square matrices, $\det(AB) = \det(A) \cdot \underline{\hspace{2cm}}$. *[1 mark]*

Part C — Short Answer

4 marks

- Q6.** Let λ be an eigenvalue of A with eigenvector v . Show that λ^2 is an eigenvalue of A^2 , and state the corresponding eigenvector. Then give a 2×2 example where A^2 has an eigenvalue that A does *not* have... is that possible if we only square eigenvalues? Justify briefly. *[4 marks]*

— *End of paper* —