

Problem Set 4, Math 54-Lec 3, Linear Algebra, Fall 2017

SEPTEMBER 11TH, 2017

Problem 1. A matrix $A \in M_{n \times n}$, is called upper-triangular if every entry below the diagonal is 0. Entries on and above the diagonal can be any real number. Let A be an upper-triangular $n \times n$ matrix with diagonal entries c_1, c_2, \dots, c_n . Compute the determinate of A . Justify your answer.

Problem 2. Let $T : \mathbb{R}^4 \rightarrow \mathbb{R}$ be a function such that:

$$T\left(\begin{bmatrix} a \\ b \\ c \\ d \end{bmatrix}\right) = \det \begin{bmatrix} a & b \\ c & d \end{bmatrix}.$$

Determine if T is a linear transformation.

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Problem 3. A matrix $Q \in M_{n \times n}$ is called orthogonal if $QQ^T = I_n$, where I_n is the $n \times n$ identity matrix. If Q is orthogonal, what are the possible values of $\det(Q)$? [*Hint:* take the determinate of both sides of the equality]

Problem 4. Let $A \in M_{n \times n}$. Show that $\det(kA) = k^n \det(A)$.