18.06 Recitation 7

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1 Problems

Problem 1.
Compute the $\det(A)$, where

$$A = \begin{pmatrix} 1 & -1 & 0 & 2 \\ 2 & -2 & 2 & 4 \\ 2 & -1 & 1 & 4 \\ 0 & 1 & 0 & 1 \end{pmatrix}.$$

Problem 2.
Given that $\det \begin{pmatrix} a & d & 0 \\ b & e & 0 \\ c & f & 1 \end{pmatrix} = 1$ and $\det \begin{pmatrix} a & d & 0 \\ b & e & 1 \\ c & f & 2 \end{pmatrix} = 2$. What can we say about the determinant of the matrices $\begin{pmatrix} a & d & 0 \\ b & e & 2 \\ c & f & 3 \end{pmatrix}$ and $\begin{pmatrix} a & d & 1 \\ b & e & 0 \\ c & f & 0 \end{pmatrix}$?

Problem 3.

(a) Find the eigenvalues and corresponding eigenvectors of $\begin{pmatrix} 3 & -1 \\ 2 & 0 \end{pmatrix}$.

(b) Compute $\begin{pmatrix} 3 & -1 \\ 2 & 0 \end{pmatrix}^5$.

Problem 4.
Suppose A is a 2×2 symmetric matrix, with **real** entries. If all the eigenvalues of A are 0, must it be the zero matrix? What if the symmetric condition is dropped?
Suppose now B is a 2×2 symmetric matrix, with **real** entries. If all the eigenvalues of B are 1, must it be the identity matrix?