

1. Find the determinant of the following matrix by hand, showing all your steps (intermediate results) along the way. Make good use of 0's.

$$\begin{bmatrix} 4 & 0 & 8 & 2 \\ 0 & 0 & 4 & 0 \\ 10 & 5 & 7 & 9 \\ 3 & 1 & 6 & 0 \end{bmatrix}$$

2. Suppose $U = \begin{bmatrix} 4 & -5 & 8 \\ 0 & 3 & 4 \\ 0 & 0 & 7 \end{bmatrix}$

Suppose the following elementary row operations turn some matrix A into U :

Step one: rows 1 and 3 of A are swapped,

Step two: in the matrix resulting from step one, the second row is multiplied by 6

Step three: in the matrix that results from step two, twice the third row is added to the second row.

Find $\det(A)$ and show all your work.

3A. Find the eigenvalues of $C = \begin{bmatrix} -59 & 84 \\ -42 & 60 \end{bmatrix}$; show all your work.

3B. One of your eigenvalues λ should be positive. Find all the corresponding eigenvectors for this λ . Verify that one of them indeed satisfies $C\mathbf{x} = \lambda\mathbf{x}$ (choose an easy \mathbf{x}).