Determinants

Hsuan-Yi Lin

March 2017

1 Determinant Computations

1. Compute the determinant of the following matrix
   $A = \left(\begin{bmatrix} 3 & 5 \\ -2 & 4 \end{bmatrix} \right)$

   - 8
   - 17
   - 22
   - 35

   Answer: det(A) = 22 because (3)(4)-(5)(-2) = 12 + 10 = 22

2. Without evaluating, give the reason why the determinant of the following matrix is equal to zero
   $A = \left(\begin{bmatrix} 0 & 0 & 0 & 0 \\ 1 & 2 & 0 & 0 \\ 0 & 4 & 3 & 0 \\ 1 & 2 & 3 & 8 \end{bmatrix} \right)$

   - A has two identical rows (columns)
   - one row(column) is a multiple of another
   - rows (column) of zeros

   Answer: it consist a row of zeros so the answer will be a muliple of zeros

3. Compute the determinant of the following matrix
   $A = \left(\begin{bmatrix} 5 & 7 & 2 & -1 \\ 0 & 2 & 4 & 0 \\ 0 & 0 & 3 & 1 \\ 0 & 0 & 0 & 8 \end{bmatrix} \right)$

   - 300
   - 120

- 72
- 240

Answer: det(A) = 240 since A is a triangular matrix, it det(A) will be the product if the entries on the main diagonal

4. Compute the minor of the following matrix
$A = \left(\begin{bmatrix} 4 & -1 & 1 & 6 \\ 0 & 0 & -3 & 3 \\ 4 & 1 & 0 & 14 \\ 4 & 1 & 3 & 2 \end{bmatrix} \right)$ What is M13?

   - 0
   - 1
   - 2
   - 7

   Answer: the answer is 0 since $M13 = \left(\begin{bmatrix} 0 & 0 & 3 \\ 4 & 1 & 14 \\ 4 & 1 & 2 \end{bmatrix} \right)$ which equals to(0 + 0 + 12) - (12 + 0 + 0) = 0

5. Find all values of x for which det(A) = 0
$A = \left(\begin{bmatrix} x-1 & 0 \\ 2 & x+1 \end{bmatrix} \right)$

   - +1
   - -1
   - A and B
   - None of the above

   Answer: Both +1 and - works. Since det(A)= (x + 1)(x - 1), so det(A) = 0 if and only if x = 1 or x = -1

6. What is the maximum number of zeroes that a 3 by 3 matrix can have without having a zero determinant?

   - 3
   - 4
   - 5
   - 6

   Answer: the matrix can have at most 6 zeros without determinant being 0. we can show by letting the matrix be a diagonal matrix with nonzero diagonal entries.