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Math 201- Lecture Participation Assignment

10 properties of the determinents

1) $\det(I_n) = a_{11}C_{11} + \underbrace{a_{12}}_{0}\cancel{C_{12}} + \underbrace{a_{13}}_{0}\cancel{C_{13}} + \dots + \underbrace{a_{1n}}_{0}\cancel{C_{1n}} = 1.\underbrace{(-1)^{1+1}}_{1}.\underbrace{\det(I_{n-1})}_{1} = 1$ //

2) The determinant changes sign when two rows are swapped.

3) The determinant is a linear function of each row of the matrix when the remaining rows are fixed.

4) If the two rows of A are equal, then $\det(A)=0$. (Because of the 2nd property)

5) Adding a constant multiple of one row to another row does not change the determinant.

6) If A has a row of zeros, then $\det(A)=0$.

7) If A is an upper triangular or lower triangular or a diagonal matrix, then

$\det(A) = a_{11}\cdot a_{22}\cdot a_{33} \cdots\cdots . a_{nn}$

8) $A \in M_{n\times n}(\mathbb{R})$ is invertible $\Leftrightarrow \det(A) \neq 0$.

($\equiv$ A is not invertible (singular) $\Leftrightarrow \det(A)=0$)

9) Given $A, B \in M_{n\times n}(\mathbb{R})$, then $\det(AB) = \det(A).\det(B)$

Nice consequence → $\det(A^{-1}) = \dfrac{1}{\det(A)}$

10) the transpose leaves the determinant alone, i.e. $\det(A) = \det(A^T)$

Nice consequence → $\det A = a_{1J}C_{1J} + a_{2J}C_{2J} + a_{3J}C_{3J} + \dots + a_{nJ}C_{nJ}$: Determinant A can be computed along any column of $A \in M_{n\times n}(\mathbb{R})$

my favourite properties are

5) because when I do elementary row op., I don't have to calculate the determinant again.

1) because it is easy to remember.

8) because it seems like a good way to decide whether a matrix is invertible or not.