

Ranks and determinants

math612.0 A1: From numbers through algebra to calculus and linear algebra

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March 7, 2022

The rank of a matrix

The rank of an $n \times p$ matrix, A , is the largest number of columns of A , which are not linearly dependent (i.e. the number of linearly independent columns).

The determinant

Recall that for a 2×2 matrix,

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

the inverse of A is

$$A^{-1} = \frac{1}{ad-bc} \begin{bmatrix} 2 & 3 \\ 3 & 1 \end{bmatrix}$$

Ranks, inverses and determinants

The following statements are true for an $n \times n$ matrix A :

- $\text{rank}(A) = n$
- $\det(A) \neq 0$
- A has an inverse

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