trace

Let A be an $n \times n$ matrix. The trace of A, denoted $tr(A)$, is the sum of the diagonal elements of A. That is,

$$tr(A) = a_{11} + a_{22} + \cdots + a_{nn}$$

Properties of trace:

- $tr(A + B) = tr(A) + tr(B)$
- $tr(A - B) = tr(A) - tr(B)$
- $tr(kA) = k \cdot tr(A)$
- $tr(AB) = tr(BA)$
- $tr(A^T) = tr(A)$

The trace will come up again in reference to eigenvalues.

determinant

Let A be an 2×2 matrix given as $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$.

The determinant of A, denoted by

$$det(A) \text{ or } |A| = \begin{vmatrix} a & b \\ c & d \end{vmatrix}$$

is given by $ad - bc$.

All good, but what if $n > 2$?

Then we need to define matrix minor and matrix cofactor.