


Inverse of 2x2 Matrix



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

 $A^{-1} = \frac{1}{\underbrace{ad - bc}} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

A^{-1} is labeled as the Inverse of A.
 $ad - bc$ is labeled as the Determinant of A.
The adjoint matrix $\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$ is labeled as the Adjoint of A.

Note: A^{-1} exists only when $ad - bc \neq 0$

Matrix $A^{-1} =$

$$\begin{pmatrix} a & b & c \\ d & e & f \\ g & h & i \end{pmatrix}^{-1} \quad (\text{matrix inverse})$$

=

$$\left(\begin{array}{ccc} \frac{fh-ei}{-aei+afh+bdi-bfg-cdh+ceg} & \frac{ch-bi}{aei-afh-bdi+bfh+cdh-ceg} & \frac{ce-bf}{-aei+afh+bdi-bfg-cdh+ceg} \\ \frac{fg-di}{aei-afh-bdi+bfh+cdh-ceg} & \frac{cg-ai}{-aei+afh+bdi-bfg-cdh+ceg} & \frac{cd-af}{aei-afh-bdi+bfh+cdh-ceg} \\ \frac{eg-dh}{-aei+afh+bdi-bfg-cdh+ceg} & \frac{bg-ah}{aei-afh-bdi+bfh+cdh-ceg} & \frac{bd-ae}{-aei+afh+bdi-bfg-cdh+ceg} \end{array} \right)$$

Note that there are only 2 common denominators in each matrix element $\pm D$, where

$$D = ceg - cdh - bfg + bdi + afh - aei, \text{ and } D \neq 0.$$