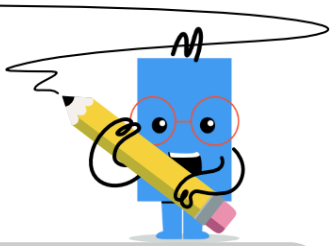
Name

Matrices - Row Operations for Finding Inverse of Matrix (3x3)



1 Subtract row 3 from row 1 of the augmented matrix as many times as needed to solve for row 1 of the inverse matrix

$$\left[\begin{array}{ccc|ccc} 1 & 0 & 6 & 1 & 0 & 0 \\ 1 & 8 & 6 & 0 & 1 & 0 \\ 0 & 0 & 3 & 0 & 0 & 1 \end{array}\right]$$

A $\left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & 0 & 0 \\ 1 & 8 & 6 & 0 & 1 & 0 \\ 0 & 0 & 3 & 0 & 0 & 1 \end{array}\right]$

B $\left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & 0 & 1 \\ 1 & 8 & 6 & 0 & 1 & 0 \\ 0 & 0 & 3 & 0 & 0 & 1 \end{array}\right]$

C $\left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & 0 & 3 \\ 1 & 8 & 6 & 0 & 1 & 0 \\ 0 & 0 & 3 & 0 & 0 & 1 \end{array}\right]$

D $\left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & 0 & -2 \\ 1 & 8 & 6 & 0 & 1 & 0 \\ 0 & 0 & 3 & 0 & 0 & 1 \end{array}\right]$

E $\left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & 0 & 6 \\ 1 & 8 & 6 & 0 & 1 & 0 \\ 0 & 0 & 3 & 0 & 0 & 1 \end{array}\right]$

F $\left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & 0 & -1 \\ 1 & 8 & 6 & 0 & 1 & 0 \\ 0 & 0 & 3 & 0 & 0 & 1 \end{array}\right]$

2 Swap rows 2 and 3 of the augmented matrix to solve those rows of the inverse matrix

$$\left[\begin{array}{ccc|ccc} 7 & 1 & 5 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 \end{array}\right]$$

A $\left[\begin{array}{ccc|ccc} 7 & 1 & 5 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 \end{array}\right]$

B $\left[\begin{array}{ccc|ccc} 7 & 1 & 5 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 \end{array}\right]$

C $\left[\begin{array}{ccc|ccc} 7 & 1 & 5 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & 1 & 0 \end{array}\right]$

D $\left[\begin{array}{ccc|ccc} 7 & 1 & 5 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 & 1 \end{array}\right]$

E $\left[\begin{array}{ccc|ccc} 7 & 1 & 5 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 & 0 \end{array}\right]$

F $\left[\begin{array}{ccc|ccc} 7 & 1 & 5 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 1 \end{array}\right]$

3 Multiply row 3 of the augmented matrix by whatever factor is needed to solve for that row of the inverse matrix

$$\left[\begin{array}{ccc|ccc} 9 & 1 & 3 & 1 & 0 & 0 \\ 1 & 9 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0.33 & 0 & 0 & 1 \end{array}\right]$$

A $\left[\begin{array}{ccc|ccc} 9 & 1 & 3 & 1 & 0 & 0 \\ 1 & 9 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0.11 & 0 & 0 & -4.5 \end{array}\right]$

B $\left[\begin{array}{ccc|ccc} 9 & 1 & 3 & 1 & 0 & 0 \\ 1 & 9 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 3 \end{array}\right]$

C $\left[\begin{array}{ccc|ccc} 9 & 1 & 3 & 1 & 0 & 0 \\ 1 & 9 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0.11 & 0 & 0 & 0 \end{array}\right]$

D $\left[\begin{array}{ccc|ccc} 9 & 1 & 3 & 1 & 0 & 0 \\ 1 & 9 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0.11 & 0 & 0 & 6 \end{array}\right]$

E $\left[\begin{array}{ccc|ccc} 9 & 1 & 3 & 1 & 0 & 0 \\ 1 & 9 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0.11 & 0 & 0 & 1.5 \end{array}\right]$

F $\left[\begin{array}{ccc|ccc} 9 & 1 & 3 & 1 & 0 & 0 \\ 1 & 9 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0.11 & 0 & 0 & -6 \end{array}\right]$

4 Subtract row 2 from row 3 of the augmented matrix as many times as needed to solve for row 3 of the inverse matrix

$$\left[\begin{array}{ccc|ccc} 2 & 1 & 9 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 & 1 & 0 \\ 0 & 6 & 1 & 0 & 0 & 1 \end{array}\right]$$

A $\left[\begin{array}{ccc|ccc} 2 & 1 & 9 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 6 & 1 \end{array}\right]$

B $\left[\begin{array}{ccc|ccc} 2 & 1 & 9 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1.5 & 1 \end{array}\right]$

C $\left[\begin{array}{ccc|ccc} 2 & 1 & 9 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 1 \end{array}\right]$

D $\left[\begin{array}{ccc|ccc} 2 & 1 & 9 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & -9 & 1 \end{array}\right]$

E $\left[\begin{array}{ccc|ccc} 2 & 1 & 9 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 7.5 & 1 \end{array}\right]$

F $\left[\begin{array}{ccc|ccc} 2 & 1 & 9 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & -3 & 1 \end{array}\right]$

5 Add row 2 to row 3 of the augmented matrix as many times as needed to solve for row 3 of the inverse matrix

$$\left[\begin{array}{ccc|ccc} 6 & 6 & 2 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 & 1 & 0 \\ 0 & -8 & 1 & 0 & 0 & 1 \end{array}\right]$$

A $\left[\begin{array}{ccc|ccc} 6 & 6 & 2 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & -8 & 1 \end{array}\right]$

B $\left[\begin{array}{ccc|ccc} 6 & 6 & 2 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 10 & 1 \end{array}\right]$

C $\left[\begin{array}{ccc|ccc} 6 & 6 & 2 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 6 & 1 \end{array}\right]$

D $\left[\begin{array}{ccc|ccc} 6 & 6 & 2 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 4 & 1 \end{array}\right]$

E $\left[\begin{array}{ccc|ccc} 6 & 6 & 2 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 12 & 1 \end{array}\right]$

F $\left[\begin{array}{ccc|ccc} 6 & 6 & 2 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & -2 & 1 \end{array}\right]$

6 Subtract row 1 from row 2 of the augmented matrix as many times as needed to solve for row 2 of the inverse matrix

$$\left[\begin{array}{ccc|ccc} 4 & 0 & 0 & 1 & 0 & 0 \\ 12 & 1 & 0 & 0 & 1 & 0 \\ 3 & 2 & 4 & 0 & 0 & 1 \end{array}\right]$$

A $\left[\begin{array}{ccc|ccc} 4 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 7.5 & 1 & 0 \\ 3 & 2 & 4 & 0 & 0 & 1 \end{array}\right]$

B $\left[\begin{array}{ccc|ccc} 4 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 4.5 & 1 & 0 \\ 3 & 2 & 4 & 0 & 0 & 1 \end{array}\right]$

C $\left[\begin{array}{ccc|ccc} 4 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & -7.5 & 1 & 0 \\ 3 & 2 & 4 & 0 & 0 & 1 \end{array}\right]$

D $\left[\begin{array}{ccc|ccc} 4 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & -3 & 1 & 0 \\ 3 & 2 & 4 & 0 & 0 & 1 \end{array}\right]$

E $\left[\begin{array}{ccc|ccc} 4 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1.5 & 1 & 0 \\ 3 & 2 & 4 & 0 & 0 & 1 \end{array}\right]$

F $\left[\begin{array}{ccc|ccc} 4 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & -4.5 & 1 & 0 \\ 3 & 2 & 4 & 0 & 0 & 1 \end{array}\right]$

7 Swap rows 1 and 2 of the augmented matrix to solve those rows of the inverse matrix

$$\left[\begin{array}{ccc|ccc} 0 & 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 & 1 & 0 \\ 0 & 5 & 3 & 0 & 0 & 1 \end{array}\right]$$

A $\left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 5 & 3 & 0 & 0 & 1 \end{array}\right]$

B $\left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 5 & 3 & 0 & 0 & 1 \end{array}\right]$

C $\left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 5 & 3 & 0 & 0 & 1 \end{array}\right]$

D $\left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 & 0 \\ 0 & 5 & 3 & 0 & 0 & 1 \end{array}\right]$

E $\left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 & 0 \\ 0 & 5 & 3 & 0 & 0 & 1 \end{array}\right]$

F $\left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 5 & 3 & 0 & 0 & 1 \end{array}\right]$

8 Swap rows 2 and 3 of the augmented matrix to solve those rows of the inverse matrix

$$\left[\begin{array}{ccc|ccc} 1 & 7 & 8 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 \end{array}\right]$$

A $\left[\begin{array}{ccc|ccc} 1 & 7 & 8 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & 1 & 0 \end{array}\right]$

B $\left[\begin{array}{ccc|ccc} 1 & 7 & 8 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 \end{array}\right]$

C $\left[\begin{array}{ccc|ccc} 1 & 7 & 8 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 & 0 \end{array}\right]$

D $\left[\begin{array}{ccc|ccc} 1 & 7 & 8 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 \end{array}\right]$

E $\left[\begin{array}{ccc|ccc} 1 & 7 & 8 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 1 \end{array}\right]$

F $\left[\begin{array}{ccc|ccc} 1 & 7 & 8 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 & 1 \end{array}\right]$