MultiplyEquivalent Matrices , Solving Matrix Equations

Show the steps to multiple each matrix **without a calculator**.

1. $\begin{bmatrix} 3 & -1 \end{bmatrix} \bullet \begin{bmatrix} 5 \\ 7 \end{bmatrix} = \begin{bmatrix} 8 \end{bmatrix}$

$(3 \bullet \underline{5}) + (-1 \bullet \underline{7}) = \underline{8}$

$15 + -7$

2. $\begin{bmatrix} 5 & 3 \\ -4 & 1 \end{bmatrix} \bullet \begin{bmatrix} -3 & 4 \\ 6 & 2 \end{bmatrix} = \begin{bmatrix} \underline{3} & \underline{26} \\ \underline{18} & \underline{-14} \end{bmatrix}$

M_{11}: $(5 \bullet \underline{-3}) + (3 \bullet \underline{6}) = \underline{3}$

M_{12}: $(5 \bullet \underline{4}) + (3 \bullet \underline{2}) = \underline{26}$

M_{21}: $(-4 \bullet \underline{-3}) + (\underline{1} \bullet \underline{6}) = \underline{18}$

M_{12}: $(\underline{-4} \bullet \underline{4}) + (\underline{1} \bullet \underline{2}) = \underline{-14}$

3. $\begin{bmatrix} a & b \\ c & d \end{bmatrix} \begin{bmatrix} p & q \\ r & s \end{bmatrix}$

m_{11}: $ap + br$

m_{12} $aq + bs$

m_{21}: $cp + dr$

m_{22}: $cq + ds$

Solve for each variable in the matrix.

4. $\begin{bmatrix} 16 & -8x \\ 3y & z \end{bmatrix} = \begin{bmatrix} 32/2 & 64 \\ 15 & 6z-20 \end{bmatrix}$

$-8x = 64$ $\boxed{x = -8}$

$3y = 15$ $\boxed{y = 5}$

$z = 6z - 20$ $-5z = -20$ $\boxed{z = 4}$

5. $\begin{bmatrix} 3x-4 \\ x+y \end{bmatrix} = \begin{bmatrix} 10x+10 \\ 15 \end{bmatrix}$

$3x - 4 = 10x + 10$ $-14 = 7x$ $\boxed{-2 = x}$

$x + y = 15$ $-2 + y = 15$ $\boxed{y = 17}$

6. $\begin{bmatrix} 23 \\ 4y-3 \\ 16 \end{bmatrix} = \begin{bmatrix} 16-x \\ -3 \\ z^2 \end{bmatrix}$

$23 = 16 - x$ $7 = -x$ $\boxed{x = -7}$

$4y - 3 = -3$ $4y = 0$ $\boxed{y = 0}$

$16 = z^2$ $\boxed{z = \pm 4}$

Find the INVERSE of the matrix, if it is defined.

7. $\begin{bmatrix} 1/2 & 0 \\ -1/6 & 1/3 \end{bmatrix}$

$\begin{bmatrix} 2 & 0 \\ 1 & 3 \end{bmatrix}$

8. $\begin{bmatrix} 1 & 7 \\ 2 & 6 \end{bmatrix}$

$\begin{bmatrix} -\frac{3}{4} & \frac{7}{8} \\ \frac{1}{4} & -\frac{1}{8} \end{bmatrix}$

9. $\begin{bmatrix} -1 & -1 \\ -1 & -1 \end{bmatrix}$

Not possible

10. $\begin{bmatrix} 8 & 7 \\ 9 & 8 \end{bmatrix}$

$\begin{bmatrix} 8 & -7 \\ -9 & 8 \end{bmatrix}$

Are the two matrices inverses? Why or why not?

11. $\begin{bmatrix} 6 & -22 \\ -12 & 20 \end{bmatrix}$ and $\begin{bmatrix} -5/36 & -11/72 \\ -1/12 & -1/24 \end{bmatrix}$

yes

1) Mult if $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ yes

or 2) Inverse 1 of them.

12. $\begin{bmatrix} 6 & -7 & 3 \\ 0 & -4 & 1 \\ -1 & 11 & -2 \end{bmatrix}$ and $\begin{bmatrix} -6 & 7 & -3 \\ 0 & 4 & -1 \\ 1 & -11 & 2 \end{bmatrix}$

NO

Solve the equations that contain matrices.

13. $X + \begin{bmatrix} -3 \\ 9 \\ -2 \end{bmatrix} = \begin{bmatrix} 7 \\ -4 \\ -6 \end{bmatrix}$

$X = \begin{bmatrix} 10 \\ -13 \\ -4 \end{bmatrix}$

14. $2X - \begin{bmatrix} -4 & 7 \\ 3 & 0 \end{bmatrix} = \begin{bmatrix} 8 & 5 \\ 0 & -4 \end{bmatrix}$

$2X = \begin{bmatrix} 4 & 12 \\ 3 & -4 \end{bmatrix}$

$X = \begin{bmatrix} 2 & 6 \\ \frac{3}{2} & -2 \end{bmatrix}$

Solve each matrix equation using inverses.

15. $\begin{bmatrix} -4 & 7 \\ 3 & 2 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 26 \\ -5 \end{bmatrix}$

A X B

$A^{-1} \cdot A \cdot X = A^{-1} B$

$X = A^{-1} \cdot B$

$X = \begin{bmatrix} 95 \\ 58 \end{bmatrix}$

16. $\begin{bmatrix} 12 & 4 \\ -8 & 15 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 64 \\ -25 \end{bmatrix}$

$A \cdot X = B$

$X = A^{-1} \cdot B$

$X = \begin{bmatrix} 5 \\ 1 \end{bmatrix}$

17. $\begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ 175 \end{bmatrix}$ N.P.

no solution

Rewrite the matrix equations (15-17) as a system of equations.(Hint: They will look like questions 21-26)

18.
$-4x + 7y = 26$
$3x + 2y = -5$

19.
$12x + 4y = 64$
$-8x + 15y = -25$

20.
$1x - 1y = 5$
$-1x + 1y = 175$

Write the matrix equation for the system. **DO NOT SOLVE.**

21.
$3x - y = 5$
$-2x + y = -4$

$\begin{bmatrix} 3 & -1 \\ -2 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ -4 \end{bmatrix}$

22.
$4x - 3y = 15$
$-2x + 4y = -24$

$\begin{bmatrix} 4 & -3 \\ -2 & 4 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 15 \\ -24 \end{bmatrix}$

23.
$5x + 9y = 1$
$-4x - 7y = 4$

$\begin{bmatrix} 5 & 9 \\ -4 & -7 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 \\ 4 \end{bmatrix}$

24.
$2x + 4y = 3$
$y = -\frac{2}{3}x + \frac{1}{3}$

$2x + 4y = 3$
$\frac{2}{3}x + y = \frac{1}{3}$

$\begin{bmatrix} 2 & 4 \\ \frac{2}{3} & 1 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3 \\ \frac{1}{3} \end{bmatrix}$

25.
$13x - y = 8$
$-2x = -4$

$\begin{bmatrix} 13 & -1 \\ -2 & 0 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 8 \\ -4 \end{bmatrix}$

26.
$6x - 3y = 15$
$x + y = -2$

$\begin{bmatrix} 6 & -3 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 15 \\ -2 \end{bmatrix}$