


7.4 Matrices and Systems of Equations.notebook

GO COUGARS! 

Homework Questions

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In Exercises 1-4, find x and y .

3. $\begin{bmatrix} 16 & 4 & 5 & 4 \\ -3 & 13 & 15 & 6 \\ 0 & 2 & 4 & 0 \end{bmatrix} \begin{bmatrix} 16 & 4 & 2x+1 & 4 \\ -3 & 13 & 15 & 3x \\ 0 & 2 & 3y-5 & 0 \end{bmatrix}$

In Exercises 5-12, if possible, find (a) $A+B$, (b) $A-B$, (c) $3A$, and (d) $3A-2B$.

7. $A = \begin{bmatrix} 6 & -1 \\ 2 & 4 \\ -3 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 4 \\ 1 & 5 \end{bmatrix}$

11. $A = \begin{bmatrix} 6 & 0 & 3 \\ -1 & -4 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 8 & -1 \\ 4 & -3 \end{bmatrix}$

In Exercises 21-24, solve for X when

$A = \begin{bmatrix} -2 & -1 \\ 1 & 0 \\ 3 & -4 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 3 \\ 2 & 0 \\ -4 & -1 \end{bmatrix}$.

21. $X + 3A = B$ 22. $2X + 2A = B$
 23. $2X + 3A = B$ 24. $2A + 4B = -2X$

In Exercises 25-32, find AB , if possible.

25. $A = \begin{bmatrix} 2 & 1 \\ -3 & 4 \\ -1 & 6 \end{bmatrix}$, $B = \begin{bmatrix} 0 & -3 & 0 \\ 4 & 0 & 2 \\ -4 & 0 & 2 \end{bmatrix}$

26. $A = \begin{bmatrix} 0 & -1 & 2 \\ 6 & 0 & 3 \\ 7 & 2 & 8 \end{bmatrix}$, $B = \begin{bmatrix} 2 & -1 \\ 4 & -5 \\ 1 & 5 \end{bmatrix}$

27. $A = \begin{bmatrix} -1 & 6 \\ -4 & 5 \\ 0 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 3 \\ 0 & 9 \end{bmatrix}$

29. $A = \begin{bmatrix} 5 & 0 \\ 0 & -8 & 0 \\ 10 & 0 & 7 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 0 & -10 & 0 & 0 \\ 0 & 0 & 7 & 1 \end{bmatrix}$

30. $A = \begin{bmatrix} 0 & 0 & 5 \\ 0 & 0 & -3 \\ 0 & 0 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 6 & -11 & 4 \\ 8 & 16 & 4 \\ 0 & 0 & 0 \end{bmatrix}$

31. $A = \begin{bmatrix} 5 \\ 6 \end{bmatrix}$, $B = \begin{bmatrix} -3 & -1 & -5 & -9 \end{bmatrix}$

32. $A = \begin{bmatrix} 1 & 0 & 3 & -2 \\ 6 & 13 & 8 & -17 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 6 \\ 4 & 2 \end{bmatrix}$

In Exercises 33-38, find, if possible, (a) AB , (b) BA , and (c) A^T . (Note: $A^T = A^T$). Use the matrix capabilities of a graphing utility to verify your results.

33. $A = \begin{bmatrix} 1 & 2 \\ 5 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 2 & -1 \\ -1 & 8 \end{bmatrix}$

34. $A = \begin{bmatrix} 6 & 3 \\ -2 & -4 \end{bmatrix}$, $B = \begin{bmatrix} -2 & 0 \\ 2 & 4 \end{bmatrix}$

35. $A = \begin{bmatrix} 3 & -1 \\ 1 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 4 & -3 \\ 3 & 1 \end{bmatrix}$

36. $A = \begin{bmatrix} -1 & 1 \\ 1 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 3 \\ -3 & 1 \end{bmatrix}$

37. $A = \begin{bmatrix} 7 \\ 1 & 2 \\ -1 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 1 & 2 \end{bmatrix}$

In Exercises 39-44, use the matrix capabilities of a graphing utility to find AB , if possible.

41. $A = \begin{bmatrix} -3 & 8 & -6 & 8 \\ -12 & 15 & 9 & 6 \\ 5 & -1 & 1 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 1 & 6 \\ 24 & 15 & 14 \\ 16 & 10 & 21 \\ 8 & -4 & 10 \end{bmatrix}$

$\Rightarrow AB = \begin{bmatrix} \dots \\ \dots \\ \dots \end{bmatrix}$

$-9 \ 2192 \ -96 \ 464$

Handwritten Solutions:

$2X + 3A = B$
 $2X + 3A - 3A = B - 3A$
 $2X = B - 3A$
 $X = \frac{1}{2}(B - 3A)$

$AB = \begin{bmatrix} -2 & 51 \\ -9 & 33 \\ 0 & 27 \end{bmatrix}$

$AB = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

$BA = \begin{bmatrix} 8 & 8 & 14 \\ 1 & 7 & -2 \end{bmatrix}$

$BA = \begin{bmatrix} 13 \end{bmatrix}$

$AB = \begin{bmatrix} 6 & 6 \\ -1 & 10 \\ -13 & 11 \end{bmatrix}$

$\frac{1}{2} \begin{bmatrix} 6 & 6 \\ -1 & 10 \\ -13 & 11 \end{bmatrix} = \begin{bmatrix} 3 & 3 \\ -0.5 & 5 \\ -6.5 & 5.5 \end{bmatrix}$

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7.4 Matrices and Systems of Equations

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Solve the system:

$$\begin{cases} -x + y - z = -14 \\ 2x - y + z = 21 \\ 3x + 2y + z = 19 \end{cases} \quad \rightarrow \quad x = 7$$

$$14 + 3y = 5$$

$$3y = -9$$

$$y = -3$$

$$-7 - 3 - z = -14$$

$$-z = -4$$

$$z = 4$$

$$(7, -3, 4)$$

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Solve the system using matrices:

$$\begin{array}{l} -x + y - z = -14 \\ 2x - y + z = 21 \\ 3x + 2y + z = 19 \end{array} \quad \begin{array}{l} \begin{bmatrix} -1 & 1 & -1 & : & -14 \\ 2 & -1 & 1 & : & 21 \\ 3 & 2 & 1 & : & 19 \end{bmatrix} \\ \begin{array}{l} R_1 + R_2 \\ \text{use} \\ \text{row operations} \end{array} \\ \begin{array}{l} \text{to make an} \\ \text{identity matrix} \\ \begin{array}{l} R_1 \\ R_2 \end{array} \end{array} \end{array} \quad \begin{array}{l} \begin{bmatrix} 1 & 0 & 0 & : & 7 \\ 0 & 1 & 0 & : & -3 \\ 3 & 2 & 1 & : & 19 \end{bmatrix} \\ -2R_2 + R_3 \end{array}$$

$$\begin{array}{l} \text{Called} \\ \text{reduced row} \\ \text{echelon form} \\ \text{(rref)} \\ \begin{array}{l} R_1 + R_2 \\ R_2 + R_3 \end{array} \end{array} \quad \begin{array}{l} \begin{bmatrix} 1 & 0 & 0 & : & 7 \\ 1 & 0 & 0 & : & 7 \\ 3 & 2 & 1 & : & 19 \end{bmatrix} \\ -3R_1 + R_3 \end{array}$$

$$\begin{array}{l} \text{What does this} \\ \text{mean? } x = 7 \end{array} \quad \begin{array}{l} \begin{bmatrix} 1 & 0 & 0 & : & 7 \\ -1 & 1 & -1 & : & -14 \\ 3 & 2 & 1 & : & 19 \end{bmatrix} \\ R_1 + R_2 \end{array} \quad \begin{array}{l} \begin{bmatrix} 1 & 0 & 0 & : & 7 \\ 0 & 1 & 0 & : & -3 \\ 0 & 0 & 1 & : & 4 \end{bmatrix} \end{array}$$

$$\begin{array}{l} R_3 + R_2 \end{array} \quad \begin{array}{l} \begin{bmatrix} 1 & 0 & 0 & : & 7 \\ 0 & 1 & -1 & : & -7 \\ 3 & 2 & 1 & : & 19 \end{bmatrix} \end{array} \quad \begin{array}{l} \begin{bmatrix} : \\ : \\ : \end{bmatrix} \end{array}$$

$$\frac{1}{3}R_3 \quad \begin{array}{l} \begin{bmatrix} 1 & 0 & 0 & : & 7 \\ 3 & 3 & 0 & : & 12 \\ 3 & 2 & 1 & : & 19 \end{bmatrix} \end{array} \quad \begin{array}{l} \begin{bmatrix} : \\ : \\ : \end{bmatrix} \end{array}$$

$$-R_1 + R_2 \quad \begin{array}{l} \begin{bmatrix} 1 & 0 & 0 & : & 7 \\ 1 & 1 & 0 & : & 4 \\ 3 & 2 & 1 & : & 19 \end{bmatrix} \end{array} \quad \begin{array}{l} \begin{bmatrix} : \\ : \\ : \end{bmatrix} \end{array}$$

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WHEW!! Now the good news...we will only be solving matrices using the calculator!

2nd x^{-1} (Matrix) over to edit, enter

choose [A], [B], [C], etc, enter

Enter the order of the matrix

Enter the coefficients and constant

Return to home screen

2nd matrix, math, [A] rref, enter

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Ex 2 Write the system of linear equations represented by the augmented matrix, then solve.

$$\begin{array}{cccc|c} x & y & z & & c \\ \left[\begin{array}{cccc|c} 1 & -2 & 1 & : & -6 \\ 0 & 1 & -5 & : & 16 \\ 0 & 0 & 1 & : & -3 \end{array} \right] & \begin{array}{l} x - 2y + z = -6 \\ y - 5z = 16 \\ z = -3 \end{array} \end{array}$$

row echelon form

back substitution \rightarrow $y - 5(-3) = 16$
 $y + 15 = 16$
 $y = 1$

$(-1, 1, -3)$

$x - 2(1) - 3 = -6$
 $x = -1$

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HOMework



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Solve #55 and #56

algebraically and check with a
calculator

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