

NON-CALCULATOR SECTION

Find the determinant.

1. $\begin{vmatrix} 2 & 1 & 1 \\ 7 & 4 & -3 \\ -1 & 5 & 1 \end{vmatrix} \begin{matrix} 2 \\ 1 \\ 5 \end{matrix}$
 $(8+3+35) - (-4-30+7)$
 $46 - (-27) = 73$

2. $\begin{vmatrix} 10 & 4 & 6 \\ 2 & -3 & 1 \\ -3 & 2 & 0 \end{vmatrix} \begin{matrix} 10 \\ 4 \\ 6 \end{matrix}$
 $(0+12+24) - (54+20+0)$
 $12 - 74 = -66$

3. Multiply if possible.
 $\begin{bmatrix} -1 & 4 & -2 \\ 1 & -1 & -4 \end{bmatrix}_{2 \times 3} \cdot \begin{bmatrix} -6 & 2 & -5 \\ 1 & -4 & 2 \\ 3 & 0 & -1 \end{bmatrix}_{3 \times 3} = \begin{bmatrix} 4 & -10 & 15 \\ -19 & 6 & -3 \end{bmatrix}$

Find the inverse, if it exists.

4. $\begin{bmatrix} 21 & 12 \\ 7 & 4 \end{bmatrix} \frac{1}{84-84} = \frac{1}{0} \times$ no inverse

5. Find the area of a triangle with vertices (3, -2), (-1, -7), (4, 11)
 $\pm \frac{1}{2} \begin{vmatrix} 3 & -2 & 1 \\ -1 & -7 & 1 \\ 4 & 11 & 1 \end{vmatrix} = \pm \frac{1}{2} \left[(-21-8-11) - (-28+33+2) \right]$

Name the dimensions of the matrices.

6. $\begin{bmatrix} 3 & 2 & 1 \\ -5 & 6 & -3 \end{bmatrix}$ 2x3
 7. $\begin{bmatrix} 8 \\ 9 \\ -2 \\ 3 \end{bmatrix}$ 4x1

8. $\begin{bmatrix} 2 & 43 \end{bmatrix}$ 1x2

$= \pm \frac{1}{2} (-40-7)$
 $= \frac{47}{2} = 23.5$

Perform indicated operations. #9-13

9. $-5 \begin{bmatrix} 6 & 2 & 0 \\ 4 & -11 & 6 \end{bmatrix}$
 $\begin{bmatrix} -30 & -10 & 0 \\ -20 & 55 & -30 \end{bmatrix}$

10. $4 \begin{bmatrix} -8 & 10 \\ 0 & -4 \end{bmatrix} - 5 \begin{bmatrix} -1 & 4 \\ 4 & 7 \end{bmatrix}$
 $\begin{bmatrix} -27 & 20 \\ -20 & -51 \end{bmatrix}$

11. $\begin{bmatrix} -6 & 9 \\ 2 & -1 \end{bmatrix} \cdot \begin{bmatrix} 5 & -2 & 4 \\ 1 & 0 & -5 \end{bmatrix}$

$\begin{bmatrix} -21 & 12 & -69 \\ 9 & -4 & 13 \end{bmatrix}$

12. $\begin{bmatrix} 7 & 0 & -8 \\ 10 & -2 & 1 \end{bmatrix} \cdot \begin{bmatrix} 3 & 2 \\ 4 & 0 \end{bmatrix}$
 Undefined

13. $8 \begin{bmatrix} 2 \\ -1 \\ 4 \end{bmatrix} + 3 \begin{bmatrix} 4 \\ -6 \\ 7 \end{bmatrix} - \begin{bmatrix} -1 \\ 8 \\ -6 \end{bmatrix} = \begin{bmatrix} 29 \\ -34 \\ 59 \end{bmatrix}$

Solve for x.

Hint: There are bars, not brackets, around the matrices.

14. $\begin{vmatrix} 5 & -4 \\ -x & 4 \end{vmatrix} = 34$

$20 - 4x = 34$
 $-4x = 14$
 $x = -\frac{7}{2}$

15. $\begin{vmatrix} 3 & -1 \\ 3 & 4x \end{vmatrix} = 21$

$12x + 3 = 21$
 $12x = 18$

$x = \frac{3}{2}$

Solve the system using matrices. Write the solutions as ordered pairs.

16. $2x + 3y = 7$
 $4x - 4y = 4$

$$\begin{bmatrix} 2 & 3 \\ 4 & -4 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 7 \\ 4 \end{bmatrix}$$

Handwritten solution: $(.8, 1)$ or $(4/5, 1)$

17. $-5x - y = 2$
 $10x + 3y = 1$

$$\begin{bmatrix} -5 & -1 \\ 10 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$$

Handwritten solution: $(-7/5, 5)$

CALCULATOR SECTION

Find the inverse if it exists.

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

Handwritten inverse: $\begin{bmatrix} -14/113 & 5/113 & -4/113 \\ 3/226 & 7/226 & 17/226 \\ 33/452 & 77/452 & -39/452 \end{bmatrix}$

19. Write as a matrix equation & solve.

$$\begin{cases} 3x + 4y + 2z = 12 \\ -2x - 3y - 4z = -12 \\ 5x + 5y + 6z = 8 \end{cases}$$

$$\begin{bmatrix} 3 & 4 & 2 \\ -2 & -3 & -4 \\ 5 & 5 & 6 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 12 \\ -12 \\ 8 \end{bmatrix}$$

Handwritten solution: $(-7, 8, 5)$

20. Write as a matrix equation & solve.

$$\begin{cases} 2x + z = 6 \\ 3x - 2y + 4z = 13 \\ -y - 3z = -15 \end{cases}$$

$$\begin{bmatrix} 2 & 0 & 1 \\ 3 & -2 & 4 \\ 0 & -1 & -3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ 13 \\ -15 \end{bmatrix}$$

Handwritten solution: $(1, 3, 4)$

21: The Arcadium arcade in Lynchburg, Tennessee uses 3 different colored tokens for their game machines. For \$20 you can purchase any of the following mixtures of tokens: 14 gold, 20 silver, and 24 bronze; OR, 20 gold, 15 silver, and 19 bronze; OR, 30 gold, 5 silver, and 13 bronze. What is the monetary value of each token?

$$\begin{cases} 14g + 20s + 24b = 20 \\ 20g + 15s + 19b = 20 \\ 30g + 5s + 13b = 20 \end{cases}$$

$$\begin{bmatrix} 14 & 20 & 24 \\ 20 & 15 & 19 \\ 30 & 5 & 13 \end{bmatrix} \begin{bmatrix} g \\ s \\ b \end{bmatrix} = \begin{bmatrix} 20 \\ 20 \\ 20 \end{bmatrix}$$

Handwritten solutions:
 gold = 50 cents
 silver = 35 cents
 bronze = 25 cents

22. Using matrices multiplication, calculate the following grade for the students using the tables below.

Student	Tests	Projects	Homework	Quizzes
Alexandra	92	100	89	80
Megan	72	85	80	75
Brittney	88	78	85	92

Type	Weight
Tests	40% (.4)
Projects	15% (.15)
Homework	25% (.25)
Quizzes	20% (.2)

$$\begin{bmatrix} 92 & 100 & 89 & 80 \\ 72 & 85 & 80 & 75 \\ 88 & 78 & 85 & 92 \end{bmatrix} \begin{bmatrix} .4 \\ .15 \\ .25 \\ .2 \end{bmatrix} = \begin{bmatrix} A \\ M \\ B \end{bmatrix}$$

Alexandra: 90%

Megan: 76.55 ~ 77%

Brittney: 86.55 ~ 87%