Matrices

Operations on Matrices

Review Queue Answers

1. 7
2. (6, -2)
3. (-1, 5)

Defining and Comparing Matrices

1. a) 2 x 2
   b) 3 x 2
   c) 2 x 3
2. B and D, A and F
3. B, C, D
4. B and D
5. 1
6. 4
7. 2
8. answers vary
9. answers vary
10.

	A	B	C	D	F
Test 1	10	8	12	4	1
Test 2	8	11	14	2	0
Test 3	13	7	8	4	3

*Note, the columns and rows could be switched.

Adding/Subtracting Matrices

1. $\begin{bmatrix} -4 & -1 \\ 8 & -4 \end{bmatrix}$
2. $\begin{bmatrix} 5 & -9 \\ -15 & 9 \\ 3 & 4 \end{bmatrix}$
3. $\begin{bmatrix} 1 & 4 \end{bmatrix}$
4. Not possible
5. $\begin{bmatrix} 31 & 3 & 4 \\ 10 & 26 & -5 \end{bmatrix}$
6. $\begin{bmatrix} 14 \\ -1 \\ -2 \end{bmatrix}$
7. $\begin{bmatrix} -1 & 3 & 0 \\ 20 & 9 & 1 \\ -1 & 4 & 11 \end{bmatrix}$
8. Not possible
9. $\begin{bmatrix} -8 & -3 \\ 17 & 9 \end{bmatrix}$
10. $\begin{bmatrix} 7 & -5 \\ -6 & 13 \end{bmatrix}$
11. $\begin{bmatrix} -1 & 1 \\ 14 & -17 \end{bmatrix}$
12. $\begin{bmatrix} 35 & -5 \\ 7 & -12 \\ -8 & -3 \end{bmatrix}$

Multiplying Matrices by a Scalar

1. $\begin{bmatrix} 6 & -3 \\ 24 & 0 \end{bmatrix}$
2. $\begin{bmatrix} 12 & -16 \\ -10 & 4 \end{bmatrix}$
3. $\begin{bmatrix} 8 \\ 4 \end{bmatrix}$
4. $\begin{bmatrix} -12 & 0 & 6 \\ 9 & -3 & -15 \end{bmatrix}$
5. $\begin{bmatrix} -15 & 5 & 10 \end{bmatrix}$
6. $\begin{bmatrix} -2 & 3 \\ -5 & -1 \\ 8 & 10 \end{bmatrix}$
7. $\begin{bmatrix} 5 & -7 \end{bmatrix}$
8. $\begin{bmatrix} -1 \\ 2 \end{bmatrix}$
9. $\begin{bmatrix} 26 & -2 \\ -5 & 14 \end{bmatrix}$
10. $\begin{bmatrix} \frac{6}{7} \\ \frac{3}{2} \end{bmatrix}$
11. $\begin{bmatrix} -32 & -6 \\ -11 & -8 \end{bmatrix}$
12. $\begin{bmatrix} -11 \\ -6 \\ 22 \end{bmatrix}$

Multiplying Matrices

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1. not possible
2. $\begin{bmatrix} 4 & \frac{8}{3} \\ -2 & 8 \end{bmatrix}$
3. $\begin{bmatrix} 5 & -1 & 1 & 12 \end{bmatrix}$

Multiplying two Matrices

1. $\begin{bmatrix} -10 & 1 \\ 6 & 15 \end{bmatrix}$
2. $\begin{bmatrix} 33 & 29 \end{bmatrix}$
3. $\begin{bmatrix} 11 & -13 \\ -21 & 23 \\ 25 & -15 \end{bmatrix}$
4. $\begin{bmatrix} 39 \\ 23 \end{bmatrix}$
5. $\begin{bmatrix} -2 & 3 & -6 \\ 8 & -12 & 24 \\ 16 & -24 & 48 \end{bmatrix}$
6. $\begin{bmatrix} 47 & -16 & 6 \end{bmatrix}$
7. $\begin{bmatrix} 2 \\ 28 \end{bmatrix}$
8. $\begin{bmatrix} 25 \end{bmatrix}$
9. $\begin{bmatrix} 26 & 3 & -3 \\ 24 & -8 & 28 \\ 6 & 18 & -23 \end{bmatrix}$
10. $\begin{bmatrix} -9 & 11 & -38 \end{bmatrix}$
11. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$
12. $\begin{bmatrix} -1 \\ 8 \\ -11 \end{bmatrix}$

Limitations of Matrix Multiplication

1. 1 x 1
2. 3 x 3
3. Cannot be Determined
4. 1 x 2
5. Cannot be Determined
6. 3 x 1
7. 2 x 3
8. Cannot be Determined
9. 1 x 3

10. 3 x 2

11. $\begin{bmatrix} 13 \\ -44 \end{bmatrix}$

12. $\begin{bmatrix} 11 & -2 & 13 \\ 64 & -34 & 16 \\ -13 & 4 & -11 \end{bmatrix}$

13. Cannot be Determined

14. $\begin{bmatrix} 6 \end{bmatrix}$

15. Cannot be Determined

16. $\begin{bmatrix} 17 & -20 \end{bmatrix}$

17. a. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ b. Identity

c. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ d. They are inverses of each other.

Using all Matrix Operations

1. $\begin{bmatrix} 6 & 2 \\ -15 & -5 \end{bmatrix}$

2. $\begin{bmatrix} -5 & 27 & 16 & -9 \\ -13 & 46 & 83 & 12 \\ 8 & -21 & -44 & -8 \end{bmatrix}$

3. $\begin{bmatrix} 21 \\ 13 \end{bmatrix}$

4. $\begin{bmatrix} 108 \end{bmatrix}$

5. $\begin{bmatrix} 50 \\ -49 \end{bmatrix}$

6. $\begin{bmatrix} 11 & -38 & 51 \\ -34 & 52 & 18 \\ 247 & 178 & 145 \end{bmatrix}$

7. $\begin{bmatrix} -2/3 & 8/3 & 4/3 \\ -2 & 8 & 4 \\ -14/3 & 56/3 & 28/3 \end{bmatrix}$

8. $\begin{bmatrix} 52 & 26 & 23 & 29 \\ 127 & 43 & 39 & 70 \\ -107 & 16 & -21 & -82 \\ -58 & 41 & 144 & 100 \end{bmatrix}$

9. $\begin{bmatrix} 24 & -76 & -36 \\ 38 & -32 & 155 \\ -34 & 106 & 47 \end{bmatrix}$

10. $\begin{bmatrix} -67/3 \\ 133/6 \end{bmatrix}$

11. Do the addition first and multiply $\begin{bmatrix} 2 & -3 \end{bmatrix}$ by the result on the left to get: $\begin{bmatrix} -3 & 12 \end{bmatrix}$

12. This one is not possible because you cannot multiply a 2 x 1 matrix and a 2 x 2 matrix together in this order.

13. $\begin{bmatrix} 1019.25 \\ 1295.25 \\ 857.75 \end{bmatrix}$

Determinants and Cramer's Rule

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1. $\begin{bmatrix} -11 \\ 28 \end{bmatrix}$

2. $\begin{bmatrix} 35 & 1 \\ 23 & -37 \end{bmatrix}$

3. $\begin{bmatrix} -28 \\ 3 \\ -1 \end{bmatrix}$

Finding Determinants of 2 x 2 and 3 x 3 Matrices

1. 13
2. 0
3. -5
4. -44
5. 1
6. -15
7. 106
8. 83
9. 30
10. 21.5 u^2
11. 112.5 u^2
12. 35 u^2
13. 7
14. -2

Cramer's Rule for 2 x 2 and 3 x 3 Matrices

1. (4, -2)
2. (-3, 1)
3. $\left(\frac{1}{2}, \frac{2}{3}\right)$
4. (-5, 0)
5. $\left(-\frac{5}{2}, -\frac{1}{3}\right)$
6. infinite solutions
7. no solution
8. (3, 11)
9. (-4, 3)
10. (2, -3, 1)
11. (-1, 2, 0)
12. $\left(\frac{1}{2}, \frac{2}{3}, -3\right)$
13. corndogs \$2.75, cotton candy \$1.75

Identity and Inverse Matrices

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1. $\begin{bmatrix} 19 & -8 \\ 57 & 4 \end{bmatrix}$
2. 146
3. (-1, 3)

Finding the Inverse of a 2 x 2 Matrix

1. yes
2. yes
3. no
4. Yes
5. $\begin{bmatrix} -2 & 7 \\ -3 & 11 \end{bmatrix}$
6. $\begin{bmatrix} 5/6 & -1/2 \\ 4/3 & -1 \end{bmatrix}$
7. $\begin{bmatrix} 9 & -2 \\ -4 & 1 \end{bmatrix}$
8. No inverse
9. $\begin{bmatrix} -3/26 & 2/13 \\ 5/26 & 1/13 \end{bmatrix}$

10. $\begin{bmatrix} -\frac{2}{3} & \frac{1}{3} \\ 1 & 0 \end{bmatrix}$

11. $\begin{bmatrix} -\frac{1}{4} & \frac{7}{8} \\ 0 & \frac{1}{2} \end{bmatrix}$

12. No inverse

Solving a Matrix Equation

1. $\begin{bmatrix} -3 & 2 \\ 4 & 0 \end{bmatrix}$

2. $\begin{bmatrix} -5 & 7 \\ 8 & 3 \end{bmatrix}$

3. $\begin{bmatrix} 4 \\ -3 \end{bmatrix}$

4. $\begin{bmatrix} -5 & 10 \\ 1 & -12 \end{bmatrix}$

5. $\begin{bmatrix} 0 & 2 \\ -4 & 6 \end{bmatrix}$

6. $\begin{bmatrix} -13 \\ 15 \end{bmatrix}$

7. $\begin{bmatrix} -3 & 1 \\ 4 & 5 \end{bmatrix}$

8. $\begin{bmatrix} 6 \\ 7 \end{bmatrix}$

9. $\begin{bmatrix} -4 & 12 \\ -1 & 5 \end{bmatrix}$

10. $\begin{bmatrix} 3 \\ 4 \end{bmatrix}$

11. $\begin{bmatrix} -11 & 10 \\ 7 & 3 \end{bmatrix}$

12. $\begin{bmatrix} 2 & -7 \\ 1 & 3 \end{bmatrix}$

Solving Systems Using Inverse Matrices

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1. $\begin{bmatrix} 3x-5y \\ 7x-y \end{bmatrix}$

2. $\begin{bmatrix} -13 \\ 7 \end{bmatrix}$

3. No solution

Writing and Solving a Matrix Equation for a Linear System

1. (5, -3)
2. (7, -11)
3. (-2, -5)
4. (9, 13)
5. no solution
6. $\left(-\frac{3}{4}, \frac{2}{3}\right)$
7. (10, -7)
8. Infinite solutions
9. (20, 25)
10. $\left(\frac{5}{2}, -\frac{1}{3}\right)$
11. (-10, 10)
12. $\left(\frac{1}{7}, \frac{3}{7}\right)$
13. \$7.50/hour mowing and \$6.50/hour raking leaves

Using a Graphing Calculator and Matrices to Solve Linear Systems in Two and Three Variables

1. $\begin{bmatrix} \frac{1}{14} & \frac{3}{28} \\ -\frac{2}{7} & \frac{1}{14} \end{bmatrix}$

2. $\begin{bmatrix} \frac{1}{6} & -\frac{2}{3} \\ \frac{1}{4} & -\frac{1}{2} \end{bmatrix}$

3. $\begin{bmatrix} \frac{30}{91} & -\frac{1}{7} & \frac{5}{91} \\ -\frac{18}{91} & \frac{2}{7} & -\frac{3}{91} \\ \frac{23}{91} & -\frac{1}{7} & \frac{19}{91} \end{bmatrix}$

4. (-5, 9)
5. (8, -1)
6. (-4, 5)
7. no solution
8. (3, 8)
9. $\left(\frac{3}{2}, -\frac{3}{5}\right)$

10. (-1, 2, -3)

11. (5, -2, 0)

12. $\left(\frac{1}{2}, 3, \frac{3}{4}\right)$

13. almonds: \$5.25/lb, cashews: \$6.50/lb
14. cookies: \$0.30, brownies: \$0.50, cupcakes: \$0.75
15. apples: \$2.49/lb, pears: \$1.99/lb, peaches: \$2.29/lb