AFM Matrices

Name: _____

Intro To Matrices

Add the following matrices.

1.	$\begin{bmatrix} 5\\0\\3 \end{bmatrix}$	8 4 1	$\begin{bmatrix} -2 \\ -1 \\ 0 \end{bmatrix}$	$+\begin{bmatrix}3\\-4\\7\end{bmatrix}$	$ \begin{array}{c} -2 & 4 \\ 2 & 3 \\ -8 & 4 \end{array} $	2.	$\begin{bmatrix} -1\\2\\4 \end{bmatrix}$		+	$\begin{bmatrix} 5\\ -1\\ -3 \end{bmatrix}$	-2 1 2	
		T			-0 + _		L 4	-5 _	,	- -5	4 —	J

Subtract the following matrices.

3.	5	8	-2		3	-2	4	4.	- 1	0]	5	-2
	0	4	-1	-	-4	2	3		2	1	-	-1	1
	L 3	1	0_		_7	-8	4 🗆		L 4	-3 _	J	L -3	2 _

Multiply the following matrices.

5.		5	8	-2	6.	_ .	-1	0
	-2	0	4	-1	$\frac{1}{2}$		2	1
		_ 3	1	0 _	2		4	-3_

Simplify the following expression.

7.	5	8	-2		Г	3	-2	4 -		8.	Γ	-1	0^{-}]	Γ	5	-2	
-3	0	4	-1	+	5	-4	2	3			2	2	1	-	2	-1	1	
	L 3	1	0_		L	_ 7	-8	4_				_ 4	-3 _	J	L	3	2 _	J

Solve for x.

$ 5. \left(\begin{bmatrix} -15 & 19 & 6 \\ 20 & -6 & -18 \\ -1 & -3x & -13 \end{bmatrix} - \begin{bmatrix} -9 & 11 & 14 \\ -8 & -1 & 16 \\ -6 & -17 & 1 \end{bmatrix} \right) + 5 \begin{bmatrix} 5 & 6 & 4 \\ -17 & -1 & 10 \\ -8 & 17 & 1 \end{bmatrix} = \begin{bmatrix} 19 & 38 & 12 \\ -57 & -10 & 16 \\ -35 & 111 & -9 \end{bmatrix} $
$ \begin{bmatrix} -17 & 4 & -1 \\ 18 & 1 & 4x \\ 10 & -5 & -14 \\ 8 & 17 & 20 \end{bmatrix} + 2 \left(\begin{bmatrix} 7 & -4 & 8 \\ -14 & 5 & 1 \\ -19 & 14 & 11 \\ 9 & -3 & 19 \end{bmatrix} - \begin{bmatrix} 14 & 18 & -11 \\ -16 & 4 & -13 \\ -9 & 12 & -4 \\ 10 & 20 & -3 \end{bmatrix} \right) = \begin{bmatrix} -31 & -40 & 37 \\ 22 & 3 & 20 \\ -10 & -1 & 16 \\ 6 & -29 & 64 \end{bmatrix} $
$\begin{bmatrix} -2x & -10 & 2 \\ -4 & 3 & 1 \end{bmatrix} + \begin{bmatrix} -12 & 12 & 7 \\ 1 & -15 & -17 \end{bmatrix} - \begin{bmatrix} -4 & 9 & 10 \\ 1 & 16 & 2 \end{bmatrix} = \begin{bmatrix} -22 & -7 & -1 \\ -4 & -28 & -18 \end{bmatrix}$
$ \begin{cases} 8. \\ -8 \\ -2x \\ 20 \end{cases} + \left(\begin{bmatrix} -16 \\ -9 \\ -12 \\ 7 \end{bmatrix} - \begin{bmatrix} 16 \\ 9 \\ -6 \\ 1 \end{bmatrix} \right) = \begin{bmatrix} -29 \\ -26 \\ -10 \\ 26 \end{bmatrix} $

Solve for x and y.

$\begin{bmatrix} 18 & -2 & -7 \\ -17 & 8 & 2 \\ 10 & -5 & -6 \end{bmatrix} \begin{bmatrix} -14 & -8 & -10 \\ 3 & 9 & 19 \\ x & -11 & 20 \end{bmatrix} = \begin{bmatrix} -132 & -85 & -358 \\ 226 & y & 362 \\ -47 & -59 & -315 \end{bmatrix}$
$ \begin{array}{c} 2 \cdot \\ \left[\begin{array}{c} 0 & 8 \\ -11 & -9 \end{array} \right] \left[\begin{array}{c} 3 & 9 \\ 18 & x \end{array} \right] = \left[\begin{array}{c} 144 & 40 \\ y & -144 \end{array} \right] $
$3. \left[\begin{array}{cc} x \end{array} \right] \left[\begin{array}{cc} -8 & 0 \end{array} \right] = \left[\begin{array}{cc} 48 & y \end{array} \right]$
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
5. $\begin{bmatrix} x & -6 & 16 & -19 \\ -16 & -12 & 19 & 3 \\ 15 & 4 & -15 & 10 \\ 17 & 14 & -17 & 5 \end{bmatrix} \begin{bmatrix} 11 & -12 \\ -17 & -4 \\ -6 & -15 \\ -10 & 0 \end{bmatrix} = \begin{bmatrix} 86 & -96 \\ -116 & -45 \\ 87 & 29 \\ y & -5 \end{bmatrix}$
$ \begin{array}{c} 6. \\ \begin{bmatrix} -14 \\ 15 \end{bmatrix} \begin{bmatrix} 17 & x \end{bmatrix} = \begin{bmatrix} -238 & 280 \\ 255 & y \end{bmatrix} $
$ \begin{array}{c} 7. \\ \begin{bmatrix} -6 & 17 \\ 13 & -8 \\ 3 & 16 \\ -11 & -16 \end{array} \end{bmatrix} \begin{bmatrix} -12 & -2 & -17 & 14 \\ 15 & -13 & x & -4 \end{bmatrix} = \begin{bmatrix} 327 & -209 & 289 & -152 \\ -276 & 78 & -309 & 214 \\ 204 & -214 & y & -22 \\ -108 & 230 & 11 & -90 \end{bmatrix} $

Understanding the Determinant and Area of Triangles

Evaluate the determinant of the matrix.

1. $\begin{bmatrix} -4 & 2 \\ 8 & 0 \end{bmatrix}$	5. $\begin{bmatrix} 7 & -7 \\ 11 & 4 \end{bmatrix}$
$2. \begin{bmatrix} 1 & 4 \\ 5 & 1 \end{bmatrix}$	$6. \begin{bmatrix} 1 & 3 \\ -2 & -6 \end{bmatrix}$
$3. \begin{bmatrix} -6 & 5 \\ 8 & 10 \end{bmatrix}$	7. $\begin{bmatrix} 4 & 6 \\ 9 & 11 \end{bmatrix}$
$4. \begin{bmatrix} 5 & 9 \\ 8 & 1 \end{bmatrix}$	8. $\begin{bmatrix} 0 & 3 \\ -2 & 9 \end{bmatrix}$

Evaluate the determinant of the matrix by using diagonals.

	[3	2	-5]
9.	6	0	-1
	0	-1	3

10.	[-1	2	7
	2	-1 -	-1
	3	5	2
11.	1 2 6 5 1 4	1 0 2	
12.	3	12	1
	-10	9	8
	-5	4	1

Solve for x.
13.
$$\begin{vmatrix} 2 & 6 \\ 1 & x \end{vmatrix} = 2$$

14. $\begin{vmatrix} x & 3 & -1 \\ 2 & 1 & -2 \\ 4 & 1 & x \end{vmatrix} = 10$
15. $\begin{vmatrix} x & 3 \\ -4 & x \end{vmatrix} = 7x$
16. $\begin{vmatrix} 2x & 0 & 3 \\ 7 & 5 & -1 \\ 4 & 2 & x \end{vmatrix} = 9x^2 - 3x + 12$

17. Given a triangle with the following vertices, find the area using the determinant formula.

a. (-1, 6), (4, 7), and (8, -6) b. (-1, -3), (4, 2), and (7, 3)

18. Given a triangle with vertices (-1, 0), (1, 3), and (5, 0), find the area using the determinant formula. Verify that area you found is correct using geometric formulas.



19. Suppose you are finding the area of a triangle with vertices (-1, -1), (4, 7), and (9, -6). You find the area of the triangle to be -52.5 and your partner works the same problem and gets +52.5. After checking both solutions, you each have done your work correctly. How can you explain this discrepancy?

20. Suppose another triangle with vertices (1, 1), (4, 2), and (7, 3) gives an area of 0. What do you know about the triangle and the points?

21. A gardener is trying to find a triangular area behind his house that encloses 1750 square feet. He has placed the first two fence posts at (0, 50) and at (40, 0). The final fence post is on the property line at y = 100. Find the point where the gardener can place the final fence post.

Real-World Applications

1. Jesse, Maria and Charles went to the local craft store to purchase supplies for making decorations for the upcoming dance at the high school. Jesse purchased three sheets of craft paper, four boxes of markers and five glue sticks. His bill, before taxes was \$24.40. Maria spent \$30.40 when she bought six sheets of craft paper, five boxes of markers and two glue sticks. Charles, purchases totaled \$13.40 when he bought three sheets of craft paper, two boxes of markers and one glue stick. Determine the unit cost of each item.

Let **x** represent the number of sheets of craft paper. Let **y** represent the number of boxes of markers. Let **z** represent the number of glue sticks.

2. Solve the following problem using your knowledge of systems of linear equations.

Rafael, an exchange student from Brazil, made phone calls within Canada, to the United States, and to Brazil. The rates per minute for these calls vary for the different countries. Use the information in the following table to determine the rates.

Month	Time within Canada (min)	Time to the U.S. (min)	Time to Brazil (min)	Charges (\$)
September	90	120	180	\$252.00
October	70	100	120	\$184.00
November	50	110	150	\$206.00

Let **x** represent the rate for calls within Canada. Let **y** represent the rate for calls to the United States.

Let **z** represent the rate for calls to Brazil.

3. Calculate the number of minutes that Carlos called within Canada, to the United States, and to Mexico during the month of December. The charges are 28¢/min within Canada, 30¢/min to the U.S., and 84¢/min to Mexico if the following conditions applied:

- His total bill for the month was \$90.96
- He talked twice as long to Mexico as he did to the U.S.
- The total number of minutes spent talking within Canada and to Mexico was 122.

Let **x** represent the number of minutes within Canada

Let **y** represent the number of minutes to the United States

Let **z** represent the number of minutes to Mexico

4. Tracy, Danielle and Sherri bought snacks for a girls' sleepover. They each bought the items shown in the following table at the local convenience store:

Number of bags of potato chips	Number of litres of pop	Number of chocolate bars	Cost (\$)
4	4	6	21.00
3	2	10	20.88
2	3	4	13.17

Calculate the unit price of each snack purchased by the girls.

Let **x** represent the unit cost of the potato chips.

Let **y** represent the unit cost of the pop.

Let **z** represent the unit cost a chocolate bar.

Exercises:

5. Solve the following systems of linear equations algebraically:

	3a - 2b + 3c = -1		3p + 3q + 2r = 7		2x + y + z = 3	c + 2d + 3e = -13	3
a)	4a - 3b + c = 7	b)	p + 2q - r = -3	c)	x + 2y - 2z = -4	d) $3c + 2d - e = -1$	
	2a + b - 2c = 16		2p - 2q - r = 8		3x - y + z = 9	2c - d + 2e = -4	

6. A local computer company sells three types of laptop computers to three nearby stores. The number of laptops ordered by each store and the amount owing to the company for the order is shown in the following table:

Store	Laptop A	Laptop B	Laptop C	Amount
				Owing(\$)
Wal-Mart	10	8	6	21 200
Sears	7	9	5	18 700
Target	8	4	3	13 000

Write a system of equations to represent the above information and determine the unit price of each type of laptop computer.

Cory, Josh and Dan went shopping for Halloween treats. Cory bought 3 chocolate pumpkins, 4 masks and 8 candy witches. He spent \$36.65. Josh bought 5 chocolate pumpkins, 3 masks and 10 candy witches. He spent \$37.50. Dan bought 4 chocolate pumpkins, 5 masks and 6 candy witches. He spent \$43.45. Write a system of equations to represent this problem and algebraically calculate the unit price of each item purchased.

8. Janet, Larry and Sam bought decorations to decorate the clubhouse for a Holiday party. The number of items bought by each person is given in the table along with the total cost of each purchase. Write a system of equations to represent this problem and algebraically calculate the unit price of each item. Each item was bought at the same store.

Name of the shopper	Number of rolls of garland	Number of wreaths	Number of poinsettias	Cost
Janet	2	4	2	\$49.50
Larry	3	2	4	\$57.75
Sam	3	3	1	\$38.50

Scan this QR code for extra practice!



To Turn In: Work out this problem on a separate sheet of paper. All work must be shown to receive full credit. The problem is due: ______

Chex Mix Fun!

Littky does not like pretzels but loves Chex Mix! One day Littky travels to General Mills and offers the factory a new way to produce Chex Mix. He asks the factory if they can produce 44 ounce bags and sell them for \$6.14. He finds out that Chex cereal costs \$0.15 per ounce, the pretzels cost \$0.08 per ounce, and the rye chips cost \$0.21 per ounce. Hating pretzels, Littky demands that the amount of cereal is three times the amount of pretzels. How much of each ingredient should be put in the new bag of Chex Mix?