HW24 - *Matrix Unit 4+ Test Review*

Name_____ Per____

Use the four matrices below for the following problems #1-8.

$$A=\begin{bmatrix}5 & 3\\ 2 & -10\end{bmatrix} \qquad B=\begin{bmatrix}9 & -1 & 2\\ -3 & 4 & 1\end{bmatrix}$$

$$C=\begin{bmatrix}3 & 1 & 3\\ 1 & 0 & 1\\ 3 & 1 & 3\end{bmatrix} \qquad D=\begin{bmatrix}2 & 3 & -4\\ 0 & 4 & -7\end{bmatrix}$$

1. AB

$\begin{bmatrix}5 & 3\\ 2 & -10\end{bmatrix}\begin{bmatrix}9 & -1 & 2\\ -3 & 4 & 1\end{bmatrix}$

$2\times 2 \quad 2\times 3$

2. A^2

$\begin{bmatrix}5 & 3\\ 2 & -10\end{bmatrix}\cdot\begin{bmatrix}5 & 3\\ 2 & -10\end{bmatrix}=\begin{bmatrix}31 & -15\\ -10 & 106\end{bmatrix}$

3. The inverse of A

$|A| = -50-6 = -56$

$A^{-1}=-\frac{1}{56}\begin{bmatrix}-10 & -3\\ -2 & 5\end{bmatrix}$

$=\begin{bmatrix}\frac{5}{28} & \frac{3}{56}\\ \frac{1}{28} & \frac{-5}{56}\end{bmatrix}$

4. $B+D$

$\begin{bmatrix}9 & -1 & 2\\ -3 & 4 & 1\end{bmatrix}+\begin{bmatrix}2 & 3 & -4\\ 0 & 4 & -7\end{bmatrix}$

$\begin{bmatrix}11 & 2 & -2\\ -3 & 8 & -6\end{bmatrix}$

5. DA

$(2\times\underline{3})(\underline{2}\times 2)$

Not possible

6. AD

$\begin{bmatrix}2 & 3 & -4\\ 0 & 4 & -7\end{bmatrix}$

$\begin{bmatrix}5 & 3\\ 2 & -10\end{bmatrix}$ | 10 | 27 | -41 / 4 | -34 | 62

$\begin{bmatrix}10 & 27 & -41\\ 4 & -34 & 62\end{bmatrix}$

7. $D-3B$

$\begin{bmatrix}2 & 3 & -4\\ 0 & 4 & -7\end{bmatrix}-3\begin{bmatrix}9 & -1 & 2\\ -3 & 4 & 1\end{bmatrix}$

$\begin{bmatrix}2 & 3 & -4\\ 0 & 4 & -7\end{bmatrix}+\begin{bmatrix}-27 & 3 & -6\\ 9 & -12 & -3\end{bmatrix}$

$\begin{bmatrix}-25 & 6 & -10\\ 9 & -8 & -10\end{bmatrix}$

8. The determinant of A

-56

Simplify. Write "undefined" for expressions that are undefined.

9) $\begin{bmatrix} 2 \\ -1 \\ 2 \\ 0 \end{bmatrix} + \begin{bmatrix} -2 \\ 2 \\ -2 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ 0 \\ 1 \end{bmatrix}$

10) $\begin{bmatrix} 6 & -1 \\ 2 & -2 \\ 1 & 0 \end{bmatrix} - \begin{bmatrix} 5 & -2 \\ -5 & 0 \\ 6 & 1 \end{bmatrix}$

$\begin{bmatrix} 1 & 1 \\ 7 & -2 \\ -5 & -1 \end{bmatrix}$

11) $3\begin{bmatrix} 3 & 5 \\ -6 & 6 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 9 & 15 \\ -18 & 18 \\ 0 & 3 \end{bmatrix}$

12) $-4\begin{bmatrix} 6 & -2 \\ -3 & 5 \end{bmatrix}$

$\begin{bmatrix} -24 & 8 \\ 12 & -20 \end{bmatrix}$

13) $\begin{bmatrix} -6 \\ -3 \\ 2 \end{bmatrix} + \begin{bmatrix} -3 \\ 4 \\ -6 \end{bmatrix} + \begin{bmatrix} 5 \\ -3 \\ -6 \end{bmatrix} = \begin{bmatrix} -4 \\ -2 \\ -10 \end{bmatrix}$

14) $2\begin{bmatrix} -5 & -2 & -4 \end{bmatrix} - \begin{bmatrix} -5 & -5 & -4 \end{bmatrix}$

$\begin{bmatrix} -10 & -4 & -8 \end{bmatrix} + \begin{bmatrix} 5 & 5 & 4 \end{bmatrix}$

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

15) $\begin{bmatrix} -6 & 0 \\ -5 & -6 \end{bmatrix} \cdot \begin{bmatrix} -1 & -6 \\ -5 & 2 \end{bmatrix}$

$\begin{array}{c|cc} & \begin{bmatrix} -1 \\ -5 \end{bmatrix} & \begin{bmatrix} -6 \\ 2 \end{bmatrix} \\ \hline \begin{bmatrix} -6 & 0 \\ -5 & -6 \end{bmatrix} & 6 & 36 \\ & 35 & 18 \end{array} = \begin{bmatrix} 6 & 36 \\ 35 & 18 \end{bmatrix}$

16) $\begin{bmatrix} -4 & 3 \\ -4 & 5 \end{bmatrix} \cdot \begin{bmatrix} 0 & 4 & -5 \\ 1 & 1 & 3 \end{bmatrix}$

$\begin{array}{c|ccc} & \begin{bmatrix} 0 \\ 1 \end{bmatrix} & \begin{bmatrix} 4 \\ 1 \end{bmatrix} & \begin{bmatrix} -5 \\ 3 \end{bmatrix} \\ \hline \begin{bmatrix} -4 & 3 \\ -4 & 5 \end{bmatrix} & 3 & -13 & 29 \\ & 5 & -11 & 35 \end{array} = \begin{bmatrix} 3 & -13 & 29 \\ 5 & -11 & 35 \end{bmatrix}$

Evaluate each determinant.

17) $\begin{vmatrix} 3 & 1 \\ 3 & -5 \end{vmatrix} = -15 - 3 = -18$

18) $\begin{vmatrix} -5 & 5 \\ -5 & 2 \end{vmatrix} = -10 - (-25)$

$= -10 + 25$

$= 15$

Find the inverse of each matrix.

19) $\begin{bmatrix} -10 & 6 \\ 10 & -6 \end{bmatrix} = \frac{1}{60-60}\begin{bmatrix} -6 & -6 \\ -10 & -10 \end{bmatrix}$

$=$ undefined

Inverse does not exist

20) $\begin{bmatrix} -10 & 9 \\ 6 & -6 \end{bmatrix} = \frac{1}{60-54}\begin{bmatrix} -6 & -9 \\ -6 & -10 \end{bmatrix}$

$= \frac{1}{6}\begin{bmatrix} -6 & -9 \\ -6 & -10 \end{bmatrix}$

$= \begin{bmatrix} -1 & -3/2 \\ -1 & -5/3 \end{bmatrix}$

Use the table below to answer the following questions #21-24. It shows the number of hair scrunchies the moms on the soccer team can make for their girls in 15 minutes.

Scrunchie type	Mom #1	Mom #2	Mom #3	Mom #4
Plain green	2	3	2	4
Fancy glittery/gold	1	2	2	1

21. Create a matrix A for this data.

$$\begin{bmatrix} 2 & 3 & 2 & 4 \\ 1 & 2 & 2 & 1 \end{bmatrix} = A$$

22. What does 3A represent?

the number of hair scrunchies the moms can make in 45 minutes (15×3)

23. Which cell gives the number of green scrunchies made by Mom #3 in 15 minutes?

$a_{1,3}$

24. What does the cell $a_{2,4}$ represent in the matrix?

the number of glittery/gold hair scrunchies mom # 4 can make

For #25-26, use $A = \begin{pmatrix} 6 & 5 \\ -1 & 4 \end{pmatrix}$. ----------*Now use a **calculator** on the rest!!!*----------

25. If $A\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -10 \\ -8 \end{bmatrix}$, what are the original two equations?

$6x + 5y = -10$

$-x + 4y = -8$

$|A| = 24 + 5 = 29$

$A^{-1} = \frac{1}{29}\begin{bmatrix} 4 & -5 \\ 1 & 6 \end{bmatrix}$

26. If $A\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -10 \\ -8 \end{bmatrix}$, what are the values of x and y?

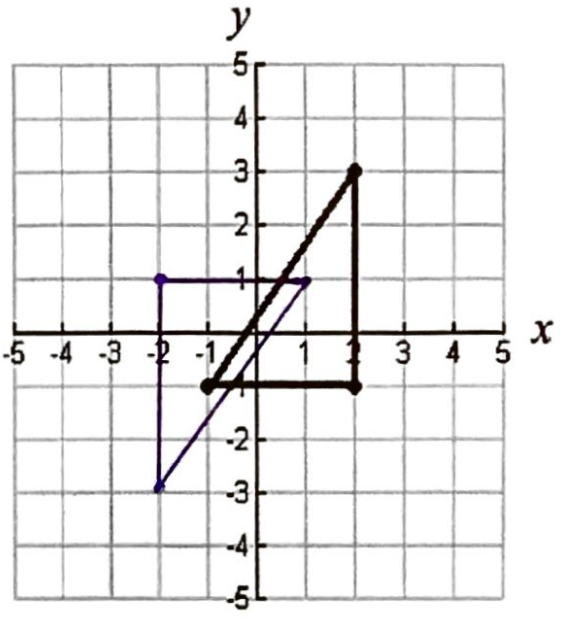
$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4/29 & -5/29 \\ 1/29 & 6/29 \end{bmatrix}\begin{bmatrix} -10 \\ -8 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -\frac{40}{29} + \frac{40}{29} \\ -\frac{10}{29} - \frac{48}{29} \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 \\ -2 \end{bmatrix}$$

Use the information for #27-28. Matrix A is a 180 degrees rotational matrix and Matrix B gives the coordinates of the shape shown.

$$A=\begin{bmatrix}-1 & 0\\ 0 & -1\end{bmatrix} \text{ and } B=\begin{bmatrix}-1 & 2 & 2\\ -1 & 3 & -1\end{bmatrix}\begin{matrix}x\\ y\end{matrix}$$



27. Calculate AB

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

$2\times 2 \qquad 2\times 3$

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

28. Graph the coordinates given by AB on the grid.

The Disney friends are hosting various dinner parties around the holidays. There are 3 catering services that they are looking into (Stonefire, Rattlers, and Woodranch). Below are the requirements for the parties.

Party/Food	Tri-Tip	Chicken	Breadsticks	Pasta
Minnie's Christmas fun night	3	7	2	1
Daisy's Hanukkah celebration	6	0	8	3
Goofy's New Year bash	2	5	3	2

Food/Cost per person	Stonefire	Rattlers	Woodranch
Tri-Tip	$5.55	$6.75	$7
Chicken	$5	$4.95	$5.25
Breadsticks	$0.90	$1	$0.50
Pasta	$5.25	$4.60	$4

29. Use matrices to determine the cost of each party using each catering service.

Stonefire Rattlers Woodranch

Minnie $\begin{bmatrix}3 & 7 & 2 & 1\\ 6 & 0 & 8 & 3\\ 2 & 5 & 3 & 2\end{bmatrix}$ Daisy Goofy $\begin{bmatrix}5.55 & 6.75 & 7\\ 5 & 4.95 & 5.25\\ 0.90 & 1 & 0.50\\ 5.25 & 4.60 & 4\end{bmatrix} = \begin{bmatrix}58.70 & 61.50 & 62.75\\ 56.25 & 62.30 & 58\\ 49.30 & 50.45 & 49.75\end{bmatrix}$

30. Which catering service should Goofy use? Explain your answer.

Stonefire is the cheapest for Goofy at $49.30

Given $A=\begin{bmatrix}2 & -2\\ -4 & 6\end{bmatrix}$ and $B=\begin{bmatrix}-9 & 4\\ -10 & 5\end{bmatrix}$ find each of the following.

31. If $A\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}-10\\ 20\end{bmatrix}$, then write the original equations.

$$\begin{bmatrix}2 & -2\\ -4 & 6\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}-10\\ 20\end{bmatrix}$$

$$2x-2y=-10$$
$$-4x+6y=20$$

$$|A| = 12-8=4$$

$$A^{-1}=\frac{1}{4}\begin{bmatrix}6 & 2\\ 4 & 2\end{bmatrix}=\begin{bmatrix}3/2 & 1/2\\ 1 & 1/2\end{bmatrix}$$

32. If $A\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}-10\\ 20\end{bmatrix}$, then solve the equations.

$2\times 2 \quad 2\times 1$

$$\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}3/2 & 1/2\\ 1 & 1/2\end{bmatrix}\begin{bmatrix}-10\\ 20\end{bmatrix}$$

$$\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}-10\cdot(\frac{3}{2})+20(\frac{1}{2})\\ -10(1)+20(\frac{1}{2})\end{bmatrix}$$

$$\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}-15+10\\ -10+10\end{bmatrix}$$

$$\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}-5\\ 0\end{bmatrix}$$

33. If $B\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}10\\ 10\end{bmatrix}$, what are the original equations?

$$\begin{bmatrix}-9 & 4\\ -10 & 5\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}10\\ 10\end{bmatrix}$$

$$-9x+4y=10$$
$$-10x+5y=10$$

$$|B| = -45-(-40)=-5$$

$$B^{-1}=-\frac{1}{5}\begin{bmatrix}5 & -4\\ 10 & -9\end{bmatrix}=\begin{bmatrix}-1 & 4/5\\ -2 & 9/5\end{bmatrix}$$

34. If $B\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}10\\ 10\end{bmatrix}$, then what is the value of x and y?

$$\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}-1 & 4/5\\ -2 & 9/5\end{bmatrix}\begin{bmatrix}10\\ 10\end{bmatrix}$$

$$\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}-10+10(\frac{4}{5})\\ -20+10(\frac{9}{5})\end{bmatrix}$$

$$\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}-10+8\\ -20+18\end{bmatrix}$$

$$\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}-2\\ -2\end{bmatrix}$$