Name: KEY

Math 125 (MATRICES)

Show ALL work: A calculator may be used for the assessment.

1. Find the product of $\begin{bmatrix} -2 & 4 \\ -1 & 0 \\ 5 & -3 \end{bmatrix} \begin{bmatrix} 1 & -2 \\ 4 & -3 \end{bmatrix}$.

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

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

$-2(1) + 4(4) = 14$

$-2(-2) + 4(-3) = -8$

$-1(1) + 0(4) = -1$

$-1(-2) + 0(-3) = 2$

$5(1) + -3(4) = -7$

$5(-2) + (-3)(-3) = -1$

2. A 2 x 3 matrix is multiplied by a 3 x 2 matrix. Find the dimensions of the product.

A. 2x2 **B.** 3x3 **C.** 6x6 **D.** 2 x 3

3. Find n in the matrix equation, $3\begin{bmatrix} -3 & 4 \\ n & 12 \end{bmatrix} + \begin{bmatrix} 0 & 6 \\ -2 & -15 \end{bmatrix} = \begin{bmatrix} -9 & 18 \\ -17 & 21 \end{bmatrix}$.

$3n + -2 = -17$

$3n = -15$

$n = -5$

4. Find the inverse of $A = \begin{bmatrix} 4 & -2 \\ 3 & -1 \end{bmatrix}$, if it exists.

$\frac{1}{4(-1) + (3)(2)} = \frac{1}{2}\begin{bmatrix} -1 & 2 \\ -3 & 4 \end{bmatrix} = \begin{bmatrix} -1/2 & 1 \\ -3/2 & 2 \end{bmatrix}$

5. Let $A = \begin{bmatrix} -8 & 1 \\ 4 & -5 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & 4 \\ -7 & -1 \end{bmatrix}$. Find $A + 3B$.

$-8 + 3(6) = 10$
$1 + 3(4) = 13$
$4 + 3(-7) = -17$
$-5 + 3(-1) = -8$

$$\begin{bmatrix} 10 & 13 \\ -17 & -8 \end{bmatrix}$$

6. Find: $4\begin{bmatrix} -5 & 7 \\ 6 & 8 \end{bmatrix} - 2\begin{bmatrix} 4 & -2 \\ 9 & 1 \end{bmatrix}$.

$$\begin{bmatrix} -20 & 28 \\ 24 & 32 \end{bmatrix} - \begin{bmatrix} 8 & -4 \\ 18 & 2 \end{bmatrix} = \begin{bmatrix} -28 & 32 \\ 6 & 30 \end{bmatrix}$$

7. Find the product of $\begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}\begin{bmatrix} 2 & -1 \\ -5 & 3 \end{bmatrix}$. =

$3(2) + 1(-5) = 1$
$3(-1) + 1(3) = 0$
$5(2) + 2(-5) = 0$
$5(-1) + 2(3) = 1$

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

- Are the two matrices (in #7) inverses of one another? Use mathematics to justify your response. Use words, symbols or both in your justification.

Yes you get the Identity Matrix when you multiply them

8. Find the values of x, y, and z that make the statement $\begin{bmatrix} 3x-5 & x+y \\ 12 & 9z \end{bmatrix} = \begin{bmatrix} 10 & 8 \\ 12 & 18 \end{bmatrix}$ true.

$3x - 5 = 10$ $\quad$ $x = 5$

$x + y = 8$ $\quad$ $y = 3$

$9z = 18$ $\quad$ $z = 2$

9. Solve the system of linear equations, $\begin{cases} 7m - 3n = 41 \\ 2m + 5n = 0 \end{cases}$ matrix row operations.

- Use mathematics to explain your response. Use words, symbols or both in your explanation.

$$\left[\begin{array}{cc|c} 7 & -3 & 41 \\ 2 & 5 & 0 \end{array}\right] \xrightarrow{R_1 - 3R_2} \left[\begin{array}{cc|c} 1 & -18 & 41 \\ 2 & 5 & 0 \end{array}\right] \xrightarrow{R_2 - 2R_1} \left[\begin{array}{cc|c} 1 & -18 & 41 \\ 0 & 41 & -82 \end{array}\right]$$

$$\xrightarrow{R_2/41} \left[\begin{array}{cc|c} 1 & -18 & 41 \\ 0 & 1 & -2 \end{array}\right] \xrightarrow{R_1 + 18R_2} \begin{array}{c} \begin{array}{ccc} M & N & \end{array} \\ \left[\begin{array}{cc|c} 1 & 0 & 5 \\ 0 & 1 & -2 \end{array}\right] \end{array}$$

$$\boxed{\begin{array}{l} m = 5 \\ n = -2 \end{array}}$$

10. If $A = \begin{bmatrix} 1 & -2 & -4 \end{bmatrix}$ and $B = \begin{bmatrix} -9 \\ 0 \\ 10 \end{bmatrix}$ find the product of AB.

$1(-9) + -2(0) + -4(10) = \begin{bmatrix} -49 \end{bmatrix}$

$-9 + 0 + -40$

11. Find A^{-1}, if it exists, for $A = \begin{bmatrix} -2 & 7 \\ 1 & -4 \end{bmatrix}$. Show work.

$$\frac{1}{(-2)(-4)-(1)(7)} = \frac{1}{1} = 1$$

$$A^{-1} = \begin{bmatrix} -4 & -7 \\ -1 & -2 \end{bmatrix}$$

12. Write the matrix equation associated with the system of equations and solve using row operations $\begin{cases} x+y=3 \\ -x+3y+4z=-3 \\ 4y+3z=2 \end{cases}$

$$\left[\begin{array}{ccc|c} 1 & 1 & 0 & 3 \\ -1 & 3 & 4 & -3 \\ 0 & 4 & 3 & 2 \end{array}\right] \xrightarrow{R_2+R_1} \left[\begin{array}{ccc|c} 1 & 1 & 0 & 3 \\ 0 & 4 & 4 & 0 \\ 0 & 4 & 3 & 2 \end{array}\right]$$

$$\xrightarrow{R_2/4} \left[\begin{array}{ccc|c} 1 & 1 & 0 & 3 \\ 0 & 1 & 1 & 0 \\ 0 & 4 & 3 & 2 \end{array}\right] \xrightarrow[R_3-4R_2]{R_1-R_2} \left[\begin{array}{ccc|c} 1 & 0 & -1 & 3 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & -1 & 2 \end{array}\right] \xrightarrow{R_3(-1)} \left[\begin{array}{ccc|c} 1 & 0 & -1 & 3 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & -2 \end{array}\right]$$

$$\xrightarrow[R_2-R_3]{R_1+R_3} \left[\begin{array}{ccc|c} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & -2 \end{array}\right]$$

$x = 1$

$y = 2$

$z = -2$