Bell Work

$$M = \begin{bmatrix} 2 & 3 \\ 9 & 14 \end{bmatrix} \qquad N = \begin{bmatrix} 14 & -3 \\ -9 & 2 \end{bmatrix}$$

1. $M + N =$

2. $N - M =$

3. $MN =$

4. $NM =$

Identity Matrix:

A special matrix where the #1 runs diagonal from the upper left corner to the lower right corner with zeros as the other numbers in the matrix.

$$I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \qquad I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \qquad I = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

1. **Multiplying with the Identify Matrices:**

Type both matrices into the calculator and multiply.

$$A = \begin{bmatrix} -3 & 4 \\ 2 & -3 \end{bmatrix} \qquad I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$AI = \begin{bmatrix} -3 & 4 \\ 2 & -3 \end{bmatrix} \qquad IA = \begin{bmatrix} -3 & 4 \\ 2 & -3 \end{bmatrix}$$

When multiplying by the identify matrix, you get the original matrix back.

2. Are A and B are inverse matrices? Yes

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

$$AB = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \qquad BA = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

If the product of 2 matrices are the identity matrix, then they are inverse matrices of each other.

3. Are C and D are inverse matrices? Yes

$$C = \begin{bmatrix} 6 & 4 \\ 7 & 5 \end{bmatrix} \qquad D = \begin{bmatrix} 2.5 & -2 \\ -3.5 & 3 \end{bmatrix}$$

$$CD = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \qquad DC = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

4. Are E and F are inverse matrices? No

$$E = \begin{bmatrix} 8 & -10 \\ -3 & 4 \end{bmatrix} \qquad F = \begin{bmatrix} 2 & 10 \\ 1.5 & 8 \end{bmatrix}$$

$$EF = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix} \qquad FE = \begin{bmatrix} -14 & 20 \\ -12 & 17 \end{bmatrix}$$

5. Are A and B are inverse matrices? Yes

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 4 \\ 5 & 6 & 0 \end{bmatrix} \qquad B = \begin{bmatrix} -24 & 18 & 5 \\ 20 & -15 & -4 \\ -5 & 4 & 1 \end{bmatrix}$$

$$AB = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \qquad BA = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

6 – 8. Find the inverse matrix for each matrix.

$$C = \begin{bmatrix} 5 & -9 \\ -4 & 7 \end{bmatrix} \qquad C^{-1} = \begin{bmatrix} -7 & -9 \\ -4 & -5 \end{bmatrix}$$

The inverse button is the same as the matrix button, but don't push the 2nd button first.

$$D = \begin{bmatrix} -8 & -5 \\ 10 & 6 \end{bmatrix} \qquad D^{-1} = \begin{bmatrix} 3 & 2.5 \\ -5 & -4 \end{bmatrix}$$

$$E = \begin{bmatrix} -10 & 16 \\ 6 & -10 \end{bmatrix} \qquad E^{-1} = \begin{bmatrix} -2.5 & -4 \\ -1.5 & -2.5 \end{bmatrix}$$

9. Find the solution to this system of equations.

$$5x - 7y = 78$$
$$6x + 4y = -18$$

$$A = \begin{bmatrix} 5 & -7 \\ 6 & 4 \end{bmatrix} \qquad B = \begin{bmatrix} 78 \\ -18 \end{bmatrix}$$

The inverse button is the same as the matrix button, but don't push the 2nd button first.

$$A^{-1}B = \begin{bmatrix} 3 \\ -9 \end{bmatrix} \qquad x = 3 \quad y = -9$$

Using the graphing calculator, we can type in the matrices. Then use the inverse matrix of coefficients times the constant matrix to solve the system of equations.

10. Find the solution to this system of equations.

$$12x + 8y = -220$$
$$7x - 15y = 29$$

$$A = \begin{bmatrix} 12 & 8 \\ 7 & -15 \end{bmatrix} \quad B = \begin{bmatrix} -220 \\ 29 \end{bmatrix}$$

The inverse button is the same as the matrix button, but don't push the 2nd button first.

$$A^{-1}B = \begin{bmatrix} -13 \\ -8 \end{bmatrix} \quad \begin{aligned} x &= -13 \\ y &= -8 \end{aligned}$$

Using the graphing calculator, we can type in the matrices. Then use the inverse matrix of coefficients times the constant matrix to solve the system of equations.

11. Find the solution to this system of equations.

$$2.4x - 5.2y = -53.4$$
$$3.9x - 1.6y = -35.4$$

$$A = \begin{bmatrix} 2.4 & -5.2 \\ 3.9 & -1.6 \end{bmatrix} \quad B = \begin{bmatrix} -53.4 \\ -35.4 \end{bmatrix}$$

The inverse button is the same as the matrix button, but don't push the 2nd button first.

$$A^{-1}B = \begin{bmatrix} -6 \\ 7.5 \end{bmatrix}$$

$$x = -6$$
$$y = 7.5$$

Using the graphing calculator, we can type in the matrices. Then use the inverse matrix of coefficients times the constant matrix to solve the system of equations.

12. Barbara, Jill, and Mary went shopping, buying jeans, T-shirts, and socks. The chart bellows explains the amount of items bought and the total cost for each person. How much did a pair of jeans, a T-shirt, and pair of socks cost?

	Pairs of Jeans	T-Shirts	Pairs of Socks	Total Cost
Barbara	2	3	4	\$121.25
Jill	3	2	3	\$141.80
Mary	2	5	2	\$140.33

$$A = \begin{bmatrix} 2 & 3 & 4 \\ 3 & 2 & 3 \\ 2 & 5 & 2 \end{bmatrix} \qquad B = \begin{bmatrix} 121.25 \\ 141.80 \\ 140.33 \end{bmatrix} \qquad A^{-1}B = \begin{bmatrix} 35.99 \\ 12.49 \\ 2.95 \end{bmatrix}$$

12. Barbara, Jill, and Mary went shopping, buying jeans, T-shirts, and socks. The chart bellows explains the amount of items bought and the total cost for each person. How much did a pair of jeans, a T-shirt, and pair of socks cost?

A pair of jeans cost \$35.99, a T-shirt cost \$12.49, and a pair of socks cost \$2.95.

Assignment:

Inverse Matrices Worksheet