[redacted]

# Today's Plan:

***Learning Target (standard)***: I will perform mathematical operations on matrices including but not limited to multiplication.

***Students will***: Complete practice problems over previous concepts at the boards, put up homework problems on the board and make necessary corrections to their own work, take notes over new material and complete practice problems over new concepts.

***Teacher will***: Provide practice problems over previous concepts, check homework problems for accuracy and provide students feedback, describe and provide examples of new concepts and assign students assessment problems over new concepts.

***Assessment***: Board work, homework check and homework assignment

***Differentiation***: Students will work at the board, go over and correct homework at their seats, actively engage in lecture over new concepts, practice new concepts with the aid of other students and the teacher and complete homework assignment.

Solve using the matrix method.

$$-3x-4y=-4$$

$$2x-4y=-9$$

$$\begin{bmatrix} -3 & -4 & \vdots & -4 \\ 2 & -4 & \vdots & -9 \end{bmatrix} \xrightarrow[-\frac{8}{3}]{-2} \begin{bmatrix} 1 & \frac{4}{3} & \vdots & \frac{4}{3} \\ 2 & -4 & \vdots & -9 \end{bmatrix} \xrightarrow{-\frac{8}{3}} \begin{bmatrix} 1 & \frac{4}{3} & \vdots & \frac{4}{3} \\ 0 & -\frac{20}{3} & \vdots & -\frac{35}{3} \end{bmatrix}$$

$$\rightarrow \begin{bmatrix} 1 & \frac{4}{3} & \vdots & \frac{4}{3} \\ 0 & 1 & \vdots & \frac{7}{4} \end{bmatrix}$$

$x+\frac{4}{3}y=\frac{4}{3}$ $\quad x+\frac{7}{3}=\frac{4}{3}$

$y=\frac{7}{4}$ $\quad x=-1$

independent

$(-1,\frac{7}{4})$

Solve using the matrix method.

$$3x+6y-3z=18$$
$$-y-6z=3$$
$$x+3y+5z=-15$$

$$\begin{bmatrix} 1 & 3 & 5 & | & -15 \\ 0 & -1 & -6 & | & 3 \\ 3 & 6 & -3 & | & 18 \end{bmatrix} \begin{matrix} \\ \\ -3 \ -9 \ -15 \ \ 45 \end{matrix} \rightarrow \begin{bmatrix} 1 & 3 & 5 & | & -15 \\ 0 & -1 & -6 & | & 3 \\ 0 & -3 & -18 & | & 63 \end{bmatrix} \rightarrow \begin{matrix} \\ \\ 0 \ 3 \ 18 \ -9 \end{matrix} \begin{bmatrix} 1 & 3 & 5 & | & -15 \\ 0 & 1 & 6 & | & -3 \\ 0 & -3 & -18 & | & 63 \end{bmatrix}$$

$$\rightarrow \begin{bmatrix} 1 & 3 & 5 & | & -15 \\ 0 & 1 & 6 & | & -3 \\ 0 & 0 & 0 & | & 54 \end{bmatrix}$$

$0 \neq 54$

inconsistent

no solution

## Matrix Addition:

dimensions must match

$$A = \begin{bmatrix} 3 & 8 & 1 \\ 4 & 0 & -3 \\ -2 & 1 & 5 \end{bmatrix}$$ 3x3

$$B = \begin{bmatrix} 2 & 0 & 9 \\ 4 & -6 & -5 \\ 0 & 7 & 2 \end{bmatrix}$$ 3x3

rows x columns

$$A+B = \begin{bmatrix} 5 & 8 & 10 \\ 8 & -6 & -8 \\ -2 & 8 & 7 \end{bmatrix}$$

When the rows and columns of a matrix are switched to create a new matrix it is called the transpose of the matrix.

$A =$ original matrix

$A^t =$ transpose matrix

$$A = \begin{bmatrix} 1 & -3 \\ 2 & -2 \end{bmatrix} \qquad A^t = \begin{bmatrix} 1 & 2 \\ -3 & -2 \end{bmatrix}$$

If $M = \begin{bmatrix} 3 & 1 & 5 \\ 4 & 0 & -2 \end{bmatrix}$

Scalar Multiplication

$$2M = \begin{bmatrix} 6 & 2 & 10 \\ 8 & 0 & -4 \end{bmatrix}$$

2 scalar

# Matrix Multiplication:

- the number of columns of the first matrix must match the number of rows of the second matrix
- the dimensions of the product will be the number of rows of the first matrix by the number of columns of the second matrix

dimension check:

$(3x2)(2x4)$ ✓ $= 3 \times 4$

$(2x3)(2x4)$ ≠ not possible

*A* is a 2 x 4 matrix, *B* is a 4 x 3 matrix, and *C* is a 3 x 4 matrix. Determine the dimensions of the indicated product matrix, if the product can be formed.

BC $= (4x3)(3x4) = 4x4$

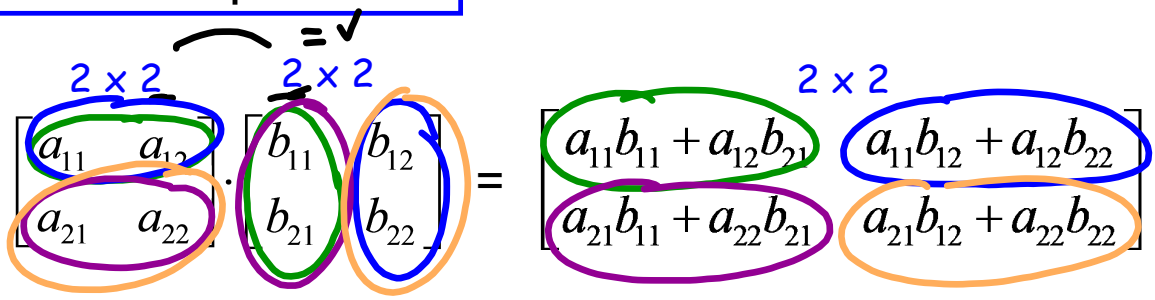
CB $= (3x4)(4x3) = 3x3$

*matrix multiplication is not commutative

A(BC) $= (2x4)(4x4) = 2x4$

A(CB) $= (2x4)(3x3) =$ not possible

## Matrix Multiplication:




Multiply a row by a column

- the row # in the first matrix and column # in the second matrix tell the position of the product in the final matrix

Find the product, if possible.

$$A = \begin{bmatrix} 7 & 6 \\ 3 & 2 \end{bmatrix} \qquad B = \begin{bmatrix} -1 & 1 \\ 2 & 7 \\ 8 & 5 \end{bmatrix}$$

2x2 3x2

$AB = (2\times2)(3\times2)$

$\neq$ not possible

Find the product, if possible.

$$A=\begin{bmatrix}7 & 6\\ 3 & 2\end{bmatrix} \qquad B=\begin{bmatrix}-1 & 1\\ 2 & 7\\ 8 & 5\end{bmatrix}$$

$BA = (3\times2)(2\times2) = 3\times2$

$$\begin{bmatrix}-1 & 1\\ 2 & 7\\ 8 & 5\end{bmatrix}\begin{bmatrix}7 & 6\\ 3 & 2\end{bmatrix} = \begin{bmatrix}-7+3 & -6+2\\ 14+21 & 12+14\\ 56+15 & 48+10\end{bmatrix}$$

$$= \begin{bmatrix}-4 & -4\\ 35 & 26\\ 71 & 58\end{bmatrix}$$

# Assignment:

Matrix Operations Wkst

#1-10