

Name: _____ Instructor: _____

Matrix Worksheet
Solving a System of Equations using a Matrix
Math 099

Your graphing calculator can help you solve a system of equations.

Given the equations:

$$3x + 2y = 12$$

$$4x - 4y = 16$$

Written as a matrix, these equations would look like the following:

3 2 12 3 represents the number in Row 1, column 1

4 -4 16 16 represents the number in row 2, column 3

To put this information into the computer:

1. Press [MATRIX] (The matrix function is a second function with x^{-1})

2. Press to display the EDIT menu.

```
NAMES MATH EDIT
1: [A] 2 X 4
2: [B]
3: [C]
4: [D]
5: [E]
```

3. This is a 2 X 3 matrix so press 2 3

```
MATRIX [A] 2 X 3
[ 0  0  0  -
[ 0  0  0  -
1, 1 = 0
```

4. Press 3 to enter the first element. The rectangular cursor moves to the next element of row 1.

```
MATRIX [A] 2 X 3
[ 3  0  0  -
[ 0  0  0  -
1, 1 = 3
```

5. Press 2 1 2 to complete the first row.

Press 4 -4 16 to enter the second row.

```
MATRIX [A] 2 X 3
[ 3  2  12 ]
[ 4 -4  16 ]
2, 3 = 16
```

6. Press (Quit is a second function with MODE)

Next we want to solve the system of equations we have just put into the calculator.

1. Press to display the MATH menu.

2. Press until you reach selection **B:rref(**

Press

```
rref(
```

3. Press

Select **matrix A**

Press The answer is shown on the screen.

```
rref([A])
[[ 1  0  4 ]
 [ 0  1  0 ]]
```

4. The result when put back into equation form is:

$$1x + 0y = 4 \quad x = 4$$

$$0x + 1y = 0 \quad y = 0$$

Follow the same steps and solve the following equations.

1. $2x + 3y = 5$
 $3x - 6y = 18$
 $x = \underline{\quad}$
 $y = \underline{\quad}$

2. $2a + b = 3$
 $a - 2b = -1$
 $a = \underline{\quad}$
 $b = \underline{\quad}$

3. $2x - 4y = 8$
 $-2x + y = 1$
 $x = \underline{\quad}$
 $y = \underline{\quad}$

4. $3u - 5v = 15$
 $-2u + v = 4$
 $u = \underline{\quad}$
 $v = \underline{\quad}$

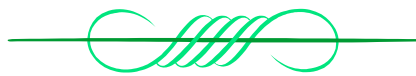
If the equations are not in standard form, change them before entering in the calculator.

Example: $-2y + 3x = 6$ change to $3x - 2y = 6$
 $y = -4x + 8$ change to $4x + y = 8$

Solve the following equations with the calculator:

5. $-x + 3y = -8$
 $2x = y + 6$
 $x = \underline{\quad}$
 $y = \underline{\quad}$

6. $7x - 2y = 3$
 $y = 4 - 2x$
 $x = \underline{\quad}$
 $y = \underline{\quad}$



This method also works with larger equations. The only change entering the information in the calculator would be in step 3. Enter it as a 3 X 4 matrix.

Solve the following:

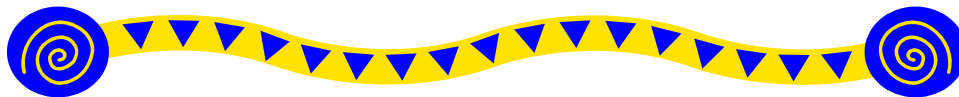
7. $-2x + y - 2z = 0$ $x = \underline{\quad}$
 $4x + 2y + 2z = -6$ $y = \underline{\quad}$
 $3x - 2y + 2z = -3$ $z = \underline{\quad}$

$$\begin{array}{l}
 8. \quad -3x - 2y + 3z = 2 \\
 \quad \quad 2x - 5y + 2z = -2 \\
 \quad \quad 4x - 3y + 4z = 10
 \end{array}
 \quad
 \begin{array}{l}
 x = \underline{\hspace{2cm}} \\
 y = \underline{\hspace{2cm}} \\
 z = \underline{\hspace{2cm}}
 \end{array}$$

$$\begin{array}{l}
 9. \quad x + 4y - z = -5 \\
 \quad \quad -2x - 3y + 2z = 5 \\
 \quad \quad x - 2/3y + z = 11/3
 \end{array}
 \quad
 \begin{array}{l}
 x = \underline{\hspace{2cm}} \\
 y = \underline{\hspace{2cm}} \\
 z = \underline{\hspace{2cm}}
 \end{array}$$

$$\begin{array}{l}
 10. \quad 3x + 3y + 2z = -3 \\
 \quad \quad -2x + 5y + 3z = 3 \\
 \quad \quad 10x - 4y - 8z = 6
 \end{array}
 \quad
 \begin{array}{l}
 x = \underline{\hspace{2cm}} \\
 y = \underline{\hspace{2cm}} \\
 z = \underline{\hspace{2cm}}
 \end{array}$$

Answers



$$\begin{array}{l}
 1. \quad 2x + 3y = 5 \\
 \quad \quad 3x - 6y = 18 \\
 \quad \quad x = 4 \\
 \quad \quad y = -1
 \end{array}$$

$$\begin{array}{l}
 2. \quad 2a + b = 3 \\
 \quad \quad a - 2b = -1 \\
 \quad \quad a = 1 \\
 \quad \quad b = -1
 \end{array}$$

$$\begin{array}{l}
 3. \quad 2x - 4y = 8 \\
 \quad \quad -2x + y = 1 \\
 \quad \quad x = -2 \\
 \quad \quad y = -3
 \end{array}$$

$$\begin{array}{l}
 4. \quad 3u - 5v = 15 \\
 \quad \quad -2u + v = 4 \\
 \quad \quad u = -5 \\
 \quad \quad v = -6
 \end{array}$$

$$\begin{array}{l}
 5. \quad -x + 3y = -8 \\
 \quad \quad 2x = y + 6 \\
 \quad \quad (2x - y = 6) \\
 \quad \quad x = 2 \\
 \quad \quad y = -2
 \end{array}$$

$$\begin{array}{l}
 6. \quad 7x - 2y = 3 \\
 \quad \quad y = 4 - 2x \\
 \quad \quad (2x + y = 4) \\
 \quad \quad x = 1 \\
 \quad \quad y = 2
 \end{array}$$

← Change the second equation. →

$$\begin{array}{l} 7. \quad -2x + y - 2z = 0 \\ \quad \quad 4x + 2y + 2z = -6 \\ \quad \quad 3x - 2y + 2z = -3 \end{array} \quad \begin{array}{l} x = -3 \\ y = 0 \\ z = 3 \end{array}$$

$$\begin{array}{l} 8. \quad -3x - 2y + 3z = 2 \\ \quad \quad 2x - 5y + 2z = -2 \\ \quad \quad 4x - 3y + 4z = 10 \end{array} \quad \begin{array}{l} x = 1 \\ y = 2 \\ z = 2 \end{array}$$

$$\begin{array}{l} 9. \quad x + 4y - z = -5 \\ \quad \quad -2x - 3y + 2z = 5 \\ \quad \quad x - 2/3y + z = 11/3 \end{array} \quad \begin{array}{l} x = 1 \\ y = -1 \\ z = 2 \end{array}$$

$$\begin{array}{l} 10. \quad 3x + 3y + 2z = -3 \\ \quad \quad -2x + 5y + 3z = 3 \\ \quad \quad 10x - 4y - 8z = 6 \end{array} \quad \begin{array}{l} x = -1 \\ y = 2 \\ z = -3 \end{array}$$