**3.6 Solving Systems Using Matrices**

**Matrix**: a rectangular array of numbers

**Matrix Element (entry)**: the numbers that make up the rows and columns of a matrix

**Dimensions:** rows by columns

**Example 1 of Identifying a Matrix Element:**

Matrix A has 2 rows and 3 columns and is   
 read as a 2x3 matrix (“two by three”)

You can call is A or

If I asked you to identify I am asking for the element in row 1 and column 2. is the element 10.

What is the element (-3) (5) (9)

**Using Matrices to Represent Systems of Equations**

Each matrix row represents an equation

The last matrix column shows the constants to the right of the   
 equal sign

The other columns represent the coefficients of one of the variables

**Example 1 of a Matrix Representing a System**

**Be careful of the order! Different orders could correspond to different systems of equations.**

**Example 2:**

Step 1: Write equation in same variable order (leave spaces for   
 coefficients of 0)

Step 2: Write the matrix using coefficients and constants.

**Example 3:**

What is the systems represented by the following matrix?

**Solving a System Using a Matrix**

You use similar steps to solve using a matrix that you use for elimination.

We call each step a **row operation**.

Goal when using of Row Operations is to get the matrix into the form:

These types of matrices are known as **Identity Matrices**, 1 on the diagonal and 0 everywhere else. They are known as identity matrices because they identify the variable.

**KEY CONCEPT: Row Operation**

**Switch any two rows**  becomes

**Multiply any row by a constant**

becomes

**Add one row to another**

becomes =

**Combine any of these Steps**

**What is the solution of the following system?**

🡪 -2(1 4 -1) Multiply Row 1 by -2.

+ 2 5 4 Add answer to Row 2.

0 -3 6 Replace Row 2 with sum.

🡪 ( 0 -3 6) Multiply Row 2 by

🡪 1 4 -1 Multiply Row 2 by -4.

-4 (0 1 -2) Add answer to Row 1.

Replace Row 1 with sum.

🡪 We created the Identity Matrix, so x=7 and y=-2

**The Solution is (7, -2).**

**Note:** Reduced Row Echelon Form is the name we give the matrix when it represents the solution. You’ll see this as rref on your calculators.

**HMWK: pg 179 #1-6, 8-15, 20-21, 25-27 (odd), 33 (challenge)**