Name: ______________________

Aim: What are matrices?

I. Do Now:

1. Solve the system of equations for x and y.

$$5x-3y=31$$
$$2x+5y=0$$

2. Decompose:

$$\frac{-4x^3+2x^2-4x+6}{(x^2+1)(x^2+3)}$$

II. Motivation: Consider the system of equations below.

$$\begin{aligned} x-2y+3z &= 9 \\ -x+3y &= -4 \\ 2x-5y+5z &= 17 \end{aligned}$$

This system of linear equations can be rewritten as a *matrix*, a rectangular, 2-dimensional array of numbers.

Coefficient Matrix:

$$\begin{bmatrix} 1 & -2 & 3 \\ -1 & 3 & 0 \\ 2 & -5 & 5 \end{bmatrix}$$

3 rows × 3 columns

Augmented Matrix (coefficients & the number to the right of the = sign):

$$\left[\begin{array}{ccc|c} 1 & -2 & 3 & 9 \\ -1 & 3 & 0 & -4 \\ 2 & -5 & 5 & 17 \end{array}\right]$$

3 rows × 4 columns

Dimensions:

Rows × Columns

The size of a matrix is determined by the number of rows and the number of columns.

A matrix is said to be of *order m* by *n*, *m* rows by *n* columns.

III. The method that we will use to manipulate matrices in order to solve systems of linear equations is called *Gauss-Jordan Elimination* in honor of two mathematicians who developed the study of matrices [Carl Friedrich Gauss (1777 – 1855) and Wilhelm Jordan (1842 – 1899)].

The following techniques are allowed:
(These are called the *elementary row operations*.)

1. Interchange two rows (each representing an equation).
2. Multiply a row by a nonzero constant (i.e., a number)
3. Add a multiple of one row to another.

Example:

$$\left[\begin{array}{cc|c} 5 & -3 & 31 \\ 2 & 5 & 0 \end{array}\right]$$

Solve using Gauss-Jordan elimination:

3. $4x-y=-1$, $2x+y=7$

4. $3x-3y=15$, $2x+4y=-8$

5. $4x-6y=-46$, $2x-7y=-43$

HW45
- Read pages 480 – 483, 504 – 506.
- p. 513: 7, 8, 9, 12, 14, 15, 21, 55, 57, 58