Section 3.1: Matrices

A **matrix** is an ordered rectangular array of numbers, letters, symbols or algebraic expressions. A matrix with m rows and n columns has **size** or **dimension** m x n.

The real numbers that make up the matrix are called **entries** or **elements** of the matrix. The entry in the ith row and jth column is denoted by a_{ij}

A matrix with only one column or one row is called a **column matrix** (or **column vector**) or **row matrix** (or **row vector**), respectively.

Example 1: Given $A = \begin{pmatrix} 2 & 7 & 7 \\ -5 & 3 & 9 \\ 0 & -10 & 20 \\ 1 & -3 & -11 \end{pmatrix}$,

a. what is the dimension of A?

b. identify a_{43}.

Systems of Linear Equations in Matrix Form

In order to write a system of linear equations in matrix form, first make sure the like variables occur in the same column. Then we'll leave out the variables of the system and simply use the coefficients and constants to write the matrix form.

Given the following system of equations:

$2x + 4y + 6z = 22$
$3x + 8y + 5z = 27$
$-x + y + 2z = 2$

The **coefficient matrix** is: $\begin{pmatrix} 2 & 4 & 6 \\ 3 & 8 & 5 \\ -1 & 1 & 2 \end{pmatrix}$

The **constant matrix** is: $\begin{pmatrix} 22 \\ 27 \\ 2 \end{pmatrix}$

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The **augmented matrix** is: $\begin{pmatrix} 2 & 4 & 6|22 \\ 3 & 8 & 5|27 \\ -1 & 1 & 2|2 \end{pmatrix}$

Example 2: Give the coefficient, constant and augmented matrix for the system of equations.

$$2x - 4y = 15$$
$$-3y + 2z = 9$$
$$x + y - 3z = -8$$