How-To: Matrix Basics

Definition: A MATRIX is a rectangular array (arrangement) of variables or constants in horizontal rows and vertical columns, usually enclosed in brackets.

Ex: $\begin{bmatrix} 2 & 1 & x \\ -1 & z & 4 \end{bmatrix}$ or $\begin{bmatrix} 2 & 9 & 0 \end{bmatrix}$ or $\begin{bmatrix} 6 & t \\ 4z & -3 \end{bmatrix}$ or $\begin{bmatrix} 4 \\ 0 \\ 5 \end{bmatrix}$ or $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$

ROWS go → that way   COLUMNS go ↓

The DIMENSION of a matrix is the number of rows, the symbol "X" and then the number of columns.

For example, the matrix $\begin{bmatrix} 2 & 1 & x \\ -1 & z & 4 \end{bmatrix}$ is a   2 X 3 matrix (we say "a 2 by 3" matrix) , since it has 2 rows and 3 columns.

Another example: $\begin{bmatrix} 2 & 9 & 0 \end{bmatrix}$ is a   1 X 3 matrix.

An element of a matrix is a number in the matrix.

$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$ if this is matrix A, then we use a small "a" to denote the elements.

The elements have the notation, a_{mn}, where m is the row it's in, and n is the column it's in.

Ex: a_{12} = 2 (row 1, column 2) a_{31} = 7 (row 3 column 1) a_{13} = 3 (row 1 column 3)

Special types of matrices:

Column Matrix: has only 1 column. Ex: $\begin{bmatrix} 4 \\ 0 \\ 5 \end{bmatrix}$

Row Matrix: has only 1 row. Ex: $\begin{bmatrix} 2 & 9 & 0 \end{bmatrix}$

Square Matrix: has the same number of rows as columns. Examples: $\begin{bmatrix} 6 & t \\ 4z & -3 \end{bmatrix}$ or $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$

Identity Matrix: has ones on the diagonal and zeros everywhere else. Ex: $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ or $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

Note: identity matrices are ALWAYS square matrices.