16.1 Matrices

Matrix: rectangular array
(used for solving systems of equations)

$$A = \begin{bmatrix} 1 & 4 & 9 \\ 2 & 6 & 0 \end{bmatrix} \qquad B = \begin{bmatrix} 1 & -1 & 6 \\ 2 & 1 & 1 \end{bmatrix}$$

Size: # rows x # columns

A is 2x3

B is 2x3

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

C is 3x2

$$A+B = \begin{bmatrix} 2 & 3 & 15 \\ 4 & 7 & 1 \end{bmatrix}$$

$$-2B = \begin{bmatrix} -2 & 2 & -12 \\ -4 & -2 & -2 \end{bmatrix}$$

$$2A-6B = \underbrace{\begin{bmatrix} 2 & 8 & 18 \\ 4 & 12 & 0 \end{bmatrix}}_{2A} + \underbrace{\begin{bmatrix} -6 & 6 & -36 \\ -12 & -6 & -6 \end{bmatrix}}_{-6B} = \begin{bmatrix} -4 & 14 & -18 \\ -8 & 6 & -6 \end{bmatrix}$$

$A+C$ is undefined (because A and C have different sizes)

Ex: Solve for x and y

a) $\begin{bmatrix} x+3 & 7 \\ -4 & y-2 \end{bmatrix} = \begin{bmatrix} 9 & 7 \\ -4 & -7 \end{bmatrix}$

all entries must be equal

$x+3=9 \Rightarrow x=6$

$y-2=-7 \Rightarrow y=-5$

b) $\begin{bmatrix} 2x+3 & 13 \end{bmatrix} = \begin{bmatrix} 11 & 9 \end{bmatrix}$

impossible

c) $\begin{bmatrix} 1 & x & 6 \\ y & 4 & 0 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

impossible

(different sizes)