

EXAMPLE 1: 2x2

$$\frac{1}{2} (10x + 6y = 2)$$

$$x - 2y = 8$$

$$5x + 3y = 1$$

$$x - 2y = 8$$

$$* (5) \begin{cases} x - 2y = 8 \\ 5x + 3y = 1 \\ \hline -(5x - 10y = 40) \end{cases}$$

$$x - 2y = 8$$

$$\frac{1}{13} (0x + 13y = -39)$$

$$*2 \begin{cases} + (0x + 2y = -6) \\ x - 2y = 8 \\ \hline (0x + 1y = -3) \end{cases}$$

$$1x + 0y = 2$$

$$0x + 1y = -3$$

soln: $x = 2$
 $y = -3$

$$\begin{bmatrix} 10 & 6 & 2 \\ 1 & -2 & 8 \end{bmatrix} \leftarrow R_1 \rightarrow \frac{1}{2} R_1$$

"Multiply Row"

$$\begin{bmatrix} 5 & 3 & 1 \\ 1 & -2 & 8 \end{bmatrix} \swarrow R_1 \leftrightarrow R_2$$

"Swap Row"

$$\begin{bmatrix} 1 & -2 & 8 \\ 5 & 3 & 1 \\ -5 & +10 & -40 \end{bmatrix} \leftarrow R_2 \rightarrow R_2 - 5R_1$$

"Add Row"

eliminate x from 2nd eqn

$$\begin{bmatrix} 1 & -2 & 8 \\ 0 & 13 & -39 \end{bmatrix} \leftarrow R_2 \rightarrow \frac{1}{13} R_2$$

$$\begin{matrix} +10 & +2 & -6 \\ \begin{bmatrix} 1 & -2 & 8 \\ 0 & 1 & -3 \end{bmatrix} \end{matrix} \uparrow R_1 \rightarrow R_1 + 2R_2$$

eliminate y from 1st eqn

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

EXAMPLE 2: 3x3

$$3x + 8y + 7z = 20$$

$$x + 2y + z = 4$$

$$2x + 7y + 9z = 23$$

EXAMPLE 3: 3x5

$$-2x_1 + 4x_2 - 6x_3 - 3x_4 - 6x_5 = -13$$

$$x_1 - 2x_2 + 3x_3 + 2x_4 + x_5 = 10$$

$$3x_1 - 6x_2 + 6x_3 + 2x_5 = -3$$