7.5 Solving Linear Systems by Elimination
(addition/subtraction method)

Goal: To eliminate one variable by adding or subtracting the two equations of the linear system.

Example: Solve each of the following systems of equations using the elimination method.

a)
$$3x + y = 13$$
$$x + y = 3$$

$$\frac{2x}{2} = \frac{10}{2}$$

$$x = 5$$

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

Solution:

$$(5, -2)$$

b)
$$2x + 3y = 18$$
$$2x - 3y = -6$$

$$4x = 12$$
$$x = 3$$

$$2x - 3y = -6$$
$$2(3) - 3y = -6$$
$$6 - 3y = -6$$
$$-3y = -12$$
$$y = 4$$

Solution:

$$(3, 4)$$

c) $3x + y = 18$ $\longrightarrow$ $3x + y = 18$

$3\begin{pmatrix} x + 2y = 11 \end{pmatrix}$ $-$ $3x + 6y = 33$

$$-5y = -15$$
$$y = 3$$

$3x + y = 18$

$3x + 3 = 18$

$3x = 15$

$x = 5$

Solution:

$(5, 3)$

d) $\begin{pmatrix} 3x - 5y = 7 \end{pmatrix}2$ $\longrightarrow$ $6x - 10y = 14$

$\begin{pmatrix} 5x - 2y = -1 \end{pmatrix}5$ $-$ $25x - 10y = -5$

$$-19x = 19$$
$$x = -1$$

$3x - 5y = 7$

$3(-1) - 5y = 7$

$-3 - 5y = 7$

$-5y = 10$

$y = -2$

Solution:

$(-1, -2)$

e) $\begin{pmatrix} \dfrac{3}{4}x - y = 2 \end{pmatrix}4$

$\begin{pmatrix} \dfrac{1}{8}x + \dfrac{1}{4}y = 2 \end{pmatrix}8$

$3x - 4y = 8$ $\longrightarrow$ $3x - 4y = 8$

$3(x + 2y = 16)$ $\longrightarrow$ $-$ $3x + 6y = 48$

$$-10y = -40$$
$$y = 4$$

$3x - 4y = 8$

$3x - 4(4) = 8$

$3x - 16 = 8$

$3x = 24$ Solution

$x = 8$ $(8, 4)$