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Date: Answer Key

Elimination Method

Solve the following systems of equations using the **elimination method**.

1.

$$\begin{array}{l} \text{Line 1: } 4x + 8y = -24 \\ \text{Line 2: } -4x - 2y = -12 \end{array} \Rightarrow \begin{array}{l} 4x + 8y = -24 \\ \underline{-4x - 2y = -12} \\ 6y = -36 \\ \underline{6} \\ y = -6 \end{array} \quad \Rightarrow \begin{array}{l} 4x + 8y = -24 \\ \underline{(-4x - 2y = -12) \cdot 4} \\ -16x - 8y = -48 \\ \underline{-12x} \\ -12 = -72 \\ \underline{-12} \\ x = 6 \end{array}$$

Solution $(6, -6)$

2.

$$\begin{array}{l} \text{Line 1: } -12x + 10y = 1 \\ \text{Line 2: } (6x + 4y = -10) \cdot 2 \end{array} \Rightarrow \begin{array}{l} -12x + 10y = 1 \\ \underline{12x + 8y = -20} \\ 18y = -19 \\ \underline{18} \\ y = -\frac{19}{18} \end{array} \quad \Rightarrow \begin{array}{l} (-12x + 10y = 1) \cdot 2 \\ \underline{(6x + 4y = -10) \cdot 5} \\ -24x + 20y = 2 \\ -30x - 20y = 50 \\ \underline{-54x} \\ -54 = 52 \\ x = -\frac{52}{54} = -\frac{26}{27} \end{array}$$

Solution $(-\frac{26}{27}, -\frac{19}{18})$

3.

$$\begin{array}{l} \text{Line 1: } 7x + 2y = 24 \\ \text{Line 2: } (4x + y = 15) \cdot 2 \end{array} \Rightarrow \begin{array}{l} 7x + 2y = 24 \\ \underline{-8x - 2y = -30} \\ -1x = -6 \\ \underline{-1} \\ x = 6 \end{array} \quad \Rightarrow \begin{array}{l} (7x + 2y = 24) \cdot 4 \\ \underline{(4x + y = 15) \cdot 7} \\ 28x + 8y = 96 \\ -28x - 7y = -105 \\ \underline{1y} \\ y = -9 \end{array}$$

Solution $(6, -9)$

4.

$$\begin{array}{l} \text{Line 1: } -3x + 5y = 12 \\ \text{Line 2: } -9x - 5y = 0 \end{array} \Rightarrow \begin{array}{l} -3x + 5y = 12 \\ \underline{-9x - 5y = 0} \\ -12x = 12 \\ \underline{-12} \\ x = -1 \end{array} \quad \Rightarrow \begin{array}{l} (-3x + 5y = 12) \cdot 3 \\ \underline{-9x - 5y = 0} \\ 9x - 15y = 36 \\ \underline{-9x - 5y = 0} \\ -20y = 36 \\ \underline{-20} \\ y = \frac{36}{20} = \frac{9}{5} \end{array}$$

Solution $(-1, \frac{9}{5})$

5.

$$\begin{array}{l} \text{Line 1: } (7x + 2y = -14) \times 2 \Rightarrow 14x + 4y = -28 \\ \text{Line 2: } -14x + y = -7 \end{array}$$

$$\begin{array}{r} 14x + 4y = -28 \\ -14x + y = -7 \\ \hline 5y = -35 \\ \frac{5y}{5} = \frac{-35}{5} \\ \boxed{y = -7} \end{array}$$

Solution $(0, -7)$

$$\begin{array}{l} 7x + 2y = -14 \\ (-14x + y = -7) \times (-2) \Rightarrow 28x - 2y = 14 \end{array}$$

$$\begin{array}{r} 7x + 2y = -14 \\ +28x - 2y = 14 \\ \hline 35x = 0 \\ \frac{35x}{35} = \frac{0}{35} \\ \boxed{x = 0} \end{array}$$

6.

$$\begin{array}{l} \text{Line 1: } (5x + 4y = -30) \times 9 \Rightarrow 45x + 36y = -270 \\ \text{Line 2: } (3x - 9y = -18) \times 4 \Rightarrow 12x - 36y = -72 \end{array}$$

$$\begin{array}{r} 45x + 36y = -270 \\ 12x - 36y = -72 \\ \hline 57x = -342 \\ \frac{57x}{57} = \frac{-342}{57} \\ \boxed{x = -6} \end{array}$$

Solution $(-6, 0)$

$$\begin{array}{l} (5x + 4y = -30) \times 3 \Rightarrow 15x + 12y = -90 \\ (3x - 9y = -18) \times (-5) \Rightarrow -15x + 45y = 90 \end{array}$$

$$\begin{array}{r} 15x + 12y = -90 \\ -15x + 45y = 90 \\ \hline 57y = 0 \\ \frac{57y}{57} = \frac{0}{57} \\ \boxed{y = 0} \end{array}$$

7.

$$\begin{array}{l} \text{Line 1: } -20y - 7x = -14 \Rightarrow -20y - 7x = -14 \\ \text{Line 2: } (10y - 2x = -4) \times 2 \Rightarrow 20y - 4x = -8 \end{array}$$

$$\begin{array}{r} -20y - 7x = -14 \\ 20y - 4x = -8 \\ \hline -11x = -22 \\ \frac{-11x}{-11} = \frac{-22}{-11} \\ \boxed{x = 2} \end{array}$$

Solution $(2, 0)$

$$\begin{array}{l} (-20y - 7x = -14) \times (-2) \Rightarrow 40y + 14x = 28 \\ (10y - 2x = -4) \times 7 \Rightarrow 70y - 14x = -28 \end{array}$$

$$\begin{array}{r} 40y + 14x = 28 \\ 70y - 14x = -28 \\ \hline 110y = 0 \\ \frac{110y}{110} = \frac{0}{110} \\ \boxed{y = 0} \end{array}$$

8.

$$\begin{array}{l} \text{Line 1: } (-7x - 8y = 9) \times 9 \Rightarrow -63x - 72y = 81 \\ \text{Line 2: } (-4x + 9y = -22) \times 8 \Rightarrow -32x + 72y = 176 \end{array}$$

$$\begin{array}{r} -63x - 72y = 81 \\ -32x + 72y = 176 \\ \hline 95x = 95 \\ \frac{95x}{95} = \frac{95}{95} \\ \boxed{x = 1} \end{array}$$

Solution $(-1, 2)$

$$\begin{array}{l} (-7x - 8y = 9) \times 4 \Rightarrow -28x - 32y = 36 \\ (-4x + 9y = -22) \times (-7) \Rightarrow 28x - 63y = 154 \end{array}$$

$$\begin{array}{r} -28x - 32y = 36 \\ 28x - 63y = 154 \\ \hline 95y = 190 \\ \frac{95y}{95} = \frac{190}{95} \\ \boxed{y = 2} \end{array}$$