

Section 4.1b – Practice Problems

Solve by the Addition Method

1. $x - y = 4$ and $x + y = -6$

$$\begin{array}{r} x - y = 4 \\ + \quad x + y = -6 \\ \hline 2x = -2 \\ x = -1 \end{array} \rightarrow \begin{array}{l} x + y = -6 \\ -1 + y = -6 \\ y = -5 \end{array}$$

Check: $-1 - (-5) = 4$
 $4 = 4 \checkmark$ $(-1, -5)$

2. $x - 2y = -1$ and $-x + y = 1$

$$\begin{array}{r} x - 2y = -1 \\ + \quad -x + y = 1 \\ \hline y = 0 \end{array} \rightarrow \begin{array}{l} x - 2y = -1 \\ x - 0 = -1 \\ x = -1 \end{array}$$

$(-1, 0)$

check: $-x + y = 1$
 $-(-1) + 0 = 1$
 $1 = 1 \checkmark$

3. $x + 2y = 3$ and $x - y = 6$

$$\begin{array}{r} x + 2y = 3 \\ + \quad 2x - 2y = 12 \\ \hline 3x = 15 \\ x = 5 \end{array} \leftarrow \begin{array}{l} (x - y = 6) \cdot 2 \\ \hline 2x - 2y = 12 \end{array}$$

$$\begin{array}{l} x = 5 \rightarrow x - y = 6 \\ 5 - y = 6 \\ -1 = y \end{array}$$

$(5, -1)$

check: $x + 2y = 3$
 $5 + 2(-1) = 3$
 $5 - 2 = 3$
 $3 = 3 \checkmark$

4. $3x - 2y = -5$ and $3x + y = -11$

$$\begin{array}{r} 3x - 2y = -5 \\ + \quad 6x + 2y = -22 \\ \hline 9x = -27 \\ x = -3 \end{array} \leftarrow \begin{array}{l} (3x + y = -11) \cdot 2 \\ \hline 6x + 2y = -22 \end{array}$$

$$\begin{array}{l} x = -3 \rightarrow 3x + y = -11 \\ 3(-3) + y = -11 \\ -9 + y = -11 \end{array}$$

$(-3, -2)$

check: $3x - 2y = -5$ $y = -2$
 $3(-3) - 2(-2) = -5$
 $-9 + 4 = -5$
 $-5 = -5 \checkmark$

PROFICIENT LEVEL QUESTIONS

5. $x = 3y$ and $y = 5x + 14$

$$x - 3y = 0 \quad (5x - y = 14) \cdot -3$$

$$\begin{array}{r} x - 3y = 0 \\ + \quad -15x + 3y = 42 \\ \hline \end{array}$$

$$-14x = 42$$

$$x = -3 \rightarrow \begin{array}{l} x = 3y \\ -3 = 3y \\ y = -1 \end{array}$$

$$\boxed{(-3, -1)}$$

check: $y = 5x + 14$
 $-1 = 5(-3) + 14$
 $-1 = -15 + 14$
 $-1 = -1 \checkmark$

6. $3x - 11 = 8y$ and $x + 6y - 8 = 0$

$$3x - 8y = 11 \quad (x + 6y = 8) \cdot -3$$

$$\begin{array}{r} 3x - 8y = 11 \\ + \quad -3x - 18y = -24 \\ \hline \end{array}$$

$$-26y = -13$$

$$y = \frac{+13}{26}$$

$$y = \frac{+1}{2}$$

$$\begin{array}{l} \rightarrow x + 6y - 8 = 0 \\ x + 6(\frac{+1}{2}) - 8 = 0 \\ x + 3 - 8 = 0 \\ x - 5 = 0 \\ x = 5 \end{array}$$

$$\boxed{(5, \frac{1}{2})}$$

check: $3x - 11 = 8y$
 $3(5) - 11 = 8(\frac{1}{2})$
 $15 - 11 = 4$
 $4 = 4 \checkmark$

7. $3x + 5y = 17$ and $4x - y = -8$

$$\begin{array}{r} + \quad 3x + 5y = 17 \\ \quad 20x - 5y = -40 \\ \hline \end{array} \quad \begin{array}{l} (4x - y = -8) \cdot 5 \\ \leftarrow \end{array}$$

$$23x = -23$$

$$x = -1 \rightarrow \begin{array}{l} 4x - y = -8 \\ 4(-1) - y = -8 \\ -4 - y = -8 \\ 4 + y = 8 \\ y = 4 \end{array}$$

$$\boxed{(-1, 4)}$$

check: $3x + 5y = 17$
 $3(-1) + 5(4) = 17$
 $-3 + 20 = 17$
 $17 = 17 \checkmark$

8. $4x + 3y = 1$ and $3x + 2y = 2$

$$\begin{array}{r} + \quad 8x + 6y = 2 \leftarrow (4x + 3y = 1) \cdot 2 \\ \quad -9x - 6y = -6 \leftarrow (3x + 2y = 2) \cdot -3 \\ \hline \end{array}$$

$$-x = -4$$

$$x = 4 \rightarrow \begin{array}{l} 4x + 3y = 1 \\ 4(4) + 3y = 1 \\ 16 + 3y = 1 \\ 3y = -15 \\ y = -5 \end{array}$$

$$\boxed{(4, -5)}$$

check: $3x + 2y = 2$
 $3(4) + 2(-5) = 2$
 $12 + (-10) = 2$
 $2 = 2 \checkmark$

9. $7x - 3y = -5$ and $3x + 5y = -21$

$(7x - 3y = -5) \cdot 5$ and $(3x + 5y = -21) \cdot 3$

$$\begin{aligned} 35x - 15y &= -25 \\ + 9x + 15y &= -63 \\ \hline 44x &= -88 \end{aligned}$$

$x = -2 \rightarrow 3x + 5y = -21$

$$\begin{aligned} 3(-2) + 5y &= -21 \\ -6 + 5y &= -21 \\ 5y &= -15 \\ y &= -3 \end{aligned}$$

$(-2, -3)$

check: $7x - 3y = -5$
 $7(-2) - 3(-3) = -5$
 $-14 + 9 = -5$
 $-5 = -5 \checkmark$

10. $5x + 2y = 8$ and $3x + 5y = 20$

$(5x + 2y = 8) \cdot 5$ and $(3x + 5y = 20) \cdot 2$

$$\begin{aligned} 25x + 10y &= 40 \\ + -6x - 10y &= -40 \\ \hline 19x &= 0 \end{aligned}$$

$x = 0 \rightarrow 3x + 5y = 20$

$$\begin{aligned} 3(0) + 5y &= 20 \\ 5y &= 20 \\ y &= 4 \end{aligned}$$

$(0, 4)$

check: $5x + 2y = 8$
 $5(0) + 2(4) = 8$
 $2(4) = 8$
 $8 = 8 \checkmark$

11. $5x - 3y = 10.5$ and $2x + 5y = -2$

$(5x - 3y = 10.5) \cdot 2$ and $(2x + 5y = -2) \cdot 5$

$$\begin{aligned} 10x - 6y &= 21 \\ + -10x - 25y &= 10 \\ \hline -31y &= 31 \end{aligned}$$

$y = -1 \rightarrow 2x + 5y = -2$

$$\begin{aligned} 2x + 5(-1) &= -2 \\ 2x - 5 &= -2 \\ 2x &= 3 \\ x &= \frac{3}{2} \end{aligned}$$

$(\frac{3}{2}, -1)$

check: $5x - 3y = 10.5$
 $5(\frac{3}{2}) - 3(-1) = 10.5$
 $\frac{15}{2} + 3 = \frac{21}{2}$
 $\frac{15}{2} + \frac{6}{2} = \frac{21}{2} \rightarrow \frac{21}{2} = \frac{21}{2} \checkmark$

12. $3x - 2y = 6$ and $-6x + 4y = -6$

$(3x - 2y = 6) \cdot 2$

$$\begin{aligned} 6x - 4y &= 12 \\ + -6x + 4y &= -6 \end{aligned}$$

$0 = 6$

no solutions

13. $3x - 2y = 6$ and $-6x + 4y = -12$

$(3x - 2y = 6) \cdot 2$

$6x - 4y = 12$

$+ \underline{-6x + 4y = -12}$

$0 = 0$



infinite solutions

14. $\frac{x}{3} + \frac{y}{4} = 1$ and $\frac{x}{2} - \frac{y}{8} = \frac{7}{2}$

$(\frac{x}{3} + \frac{y}{4} = 1) \cdot 12 \rightarrow 4x + 3y = 12$

$(\frac{x}{2} - \frac{y}{8} = \frac{7}{2}) \cdot 8 \rightarrow -4x + y = -28$

$4y = -16$

$\frac{x}{3} + \frac{y}{4} = 1 \leftarrow y = -4$

$(\frac{x}{3} + \frac{y}{4} = 1) \cdot 3$

$x - 3 = 3$

(6, -4)

$x = 6$ check $\frac{x}{2} - \frac{y}{8} = \frac{7}{2}$

$\frac{6}{2} - \frac{-4}{8} = \frac{7}{2}$

$3 + \frac{1}{2} = \frac{7}{2}$

$\frac{6}{2} + \frac{1}{2} = \frac{7}{2} \rightarrow \frac{7}{2} = \frac{7}{2} \checkmark$

EXTENDING LEVEL QUESTIONS

15. $\frac{3}{x} + \frac{4}{y} = \frac{5}{2}$ and $-\frac{5}{x} + \frac{3}{y} = -\frac{7}{4}$

$(\frac{3}{x} + \frac{4}{y} = \frac{5}{2}) \cdot 5$

$(-\frac{5}{x} + \frac{3}{y} = -\frac{7}{4}) \cdot 3$

$\frac{15}{x} + \frac{20}{y} = \frac{25}{2}$

$-\frac{15}{x} + \frac{9}{y} = -\frac{21}{4}$

$\frac{15}{x} + \frac{20}{y} = \frac{50}{4}$ (change for common denominator)

$+ \frac{15}{x} + \frac{9}{y} = -\frac{21}{4}$

$\frac{3}{x} + \frac{4}{y} = \frac{5}{2}$

$\frac{3}{x} + \frac{4}{y} = \frac{5}{2}$

$\frac{3}{x} = \frac{5}{2} - \frac{4}{y}$

$\frac{3}{x} = \frac{3}{2}$

$x = 2$

(2, 4)

Check: $-\frac{5}{x} + \frac{3}{y} = -\frac{7}{4}$

$-\frac{5}{2} + \frac{3}{4} = -\frac{7}{4}$

$-\frac{10}{4} + \frac{3}{4} = -\frac{7}{4}$

$-\frac{7}{4} = -\frac{7}{4} \checkmark$

16. $\frac{6}{x} - \frac{9}{y} = 3$ and $\frac{5}{x} - \frac{6}{y} = 2$

$(\frac{6}{x} - \frac{9}{y} = 3) \cdot 6 \rightarrow \frac{36}{x} - \frac{54}{y} = 18$

$(\frac{5}{x} - \frac{6}{y} = 2) \cdot -9 \rightarrow \frac{-45}{x} + \frac{54}{y} = -18$

$-\frac{9}{x} = 0$

$-9 = 0$

no solutions

17. $(0.1x + 0.01y = 0.73)$ and $(0.2x + 0.05y = 1.55)$

$-5(10x + y = 73)$ $20x + 5y = 155$

$-50x - 5y = -365$
 $20x + 5y = 155$

$-30x = -210$

$x = \frac{-210}{-30}$

$x = 7$

$(7, 3)$

$10(7) + y = 73$

$70 + y = 73$

$y = 3$

check: $0.2x + 0.05y = 1.55$
 $0.2(7) + 0.05(3) = 1.55$
 $1.4 + 0.15 = 1.55$
 $1.55 = 1.55 \checkmark$

18. $0.02x + \frac{y}{2} = 0.4$ and $\frac{x}{2} - 0.4y = -2.9$

$(0.02x + 0.5y = 0.4)$ and $(0.5x - 0.4y = -2.9)$

$(2x + 50y = 40)$ and $(5x - 4y = -29)$

$10x + 250y = 200$

$-10x + 8y = 58$

$258y = 258$

$y = 1$

$5x - 4(1) = -29$

$5x - 4 = -29$

$5x = -25$

$x = -5$

$(-5, 1)$

check: $0.02x + \frac{y}{2} = 0.4$
 $0.02(-5) + \frac{1}{2} = 0.4$
 $-0.1 + 0.5 = 0.4$
 $0.4 = 0.4 \checkmark$

19. $\frac{x}{2} + \frac{y}{5} = \frac{4}{5}$ and $\frac{x}{6} - \frac{y}{2} = \frac{5}{6}$

$(\frac{x}{2} + \frac{y}{5} = \frac{4}{5}) \cdot 10 \rightarrow 5x + 2y = 8$

$(\frac{x}{6} - \frac{y}{2} = \frac{5}{6}) \cdot 6 \rightarrow (x - 3y = 5)$

$5x + 2y = 8$

$-5x + 15y = -25$

$17y = -17$

$y = -1$

$x - 3(-1) = 5$

$x + 3 = 5$

$x = 2$

check: $\frac{x}{6} - \frac{y}{2} = \frac{5}{6}$
 $\frac{2}{6} - \frac{-1}{2} = \frac{5}{6}$
 $\frac{2}{6} + \frac{3}{6} = \frac{5}{6}$
 $\frac{5}{6} = \frac{5}{6} \checkmark$

20. $\frac{x}{4} - \frac{y}{2} = \frac{7}{24}$ and $\frac{x}{3} + \frac{y}{2} = 0$

$\frac{x}{4} - \frac{y}{2} = \frac{7}{24}$

$+\frac{x}{3} + \frac{y}{2} = 0$

} no need to cancel denominator
 $-\frac{y}{2}$ and $\frac{y}{2}$ already cancel

$\frac{7}{12}x = \frac{7}{24}$

$x = \frac{1}{2} \rightarrow \frac{x}{4} - \frac{y}{2} = \frac{7}{24}$

$(\frac{1}{2})(\frac{1}{4}) - \frac{y}{2} = \frac{7}{24}$

$\frac{1}{8} - \frac{y}{2} = \frac{7}{24}$

$-\frac{y}{2} = \frac{1}{6}$

$y = -\frac{1}{3}$

$(\frac{1}{2}, -\frac{1}{3})$

check: $\frac{x}{3} + \frac{y}{2} = 0$

$(\frac{1}{2})(\frac{1}{3}) + (-\frac{1}{3})(\frac{1}{2}) = 0$

$\frac{1}{6} - \frac{1}{6} = 0$

$0 = 0 \checkmark$