

**Section 4.2a – Practice Problems**

**EMERGING LEVEL QUESTIONS**

Solve by the substitution method

1.  $y = -x + 2$  and  $2x - y = 4$

$$y = -x + 2$$

$$2x - y = 4$$

$$2x - (-x + 2) = 4$$

$$2x + x - 2 = 4$$

$$3x = 6$$

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

$$\boxed{(2, 0)} \quad y = -2 + 2$$

$$y = 0$$

check:  $2x - y = 4$

$$2(2) - 0 = 4$$

$$4 = 4 \checkmark$$

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

$$x - 2y = 5$$

$$(3y + 2) - 2y = 5$$

$$y + 2 = 5$$

$$y = 3 \rightarrow x = 3y + 2$$

$$x = 3(3) + 2$$

$$x = 11$$

$$\boxed{(11, 3)}$$

check:  $x - 2y = 5$

$$11 - 2(3) = 5$$

$$11 - 6 = 5$$

$$5 = 5 \checkmark$$

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

$$4x - 3y = 2$$

$$4x - 3(2x + 1) = 2$$

$$4x - 6x - 3 = 2$$

$$-2x - 3 = 2$$

$$-2x = 5$$

$$x = -\frac{5}{2} \rightarrow y = 2x + 1$$

$$y = -\frac{5}{2}(2) + 1$$

$$y = -5 + 1$$

$$y = -4$$

$$\boxed{(-\frac{5}{2}, -4)}$$

check:  $4x - 3y = 2$

$$4(-\frac{5}{2}) - 3(-4) = 2$$

$$-10 + 12 = 2$$

$$2 = 2 \checkmark$$

4.  $3x + 2y = 0$  and  $x - 3y = 0$

$$x - 3y = 0$$

$$x = 3y \rightarrow 3x + 2y = 0$$

$$3(3y) + 2y = 0$$

$$9y + 2y = 0$$

$$11y = 0$$

$$y = 0 \rightarrow x - 3y = 0$$

$$x - 3(0) = 0$$

$$x = 0$$

$$\boxed{(0, 0)}$$

check:  $3x + 2y = 0$

$$3(0) + 2(0) = 0$$

$$0 = 0 \checkmark$$

PROFICIENT LEVEL QUESTIONS

5.  $2x - y = 5$  and  $-4x + 2y = -10$

$$-4x + 2y = -10$$

$$2y = -10 + 4x$$

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

$$2x - (-5 + 2x) = 5$$

$$2x + 5 - 2x = 5$$

$$5 = 5$$



infinite solutions

6.  $3x - y = 5$  and  $-3x + y = 5$

$$-3x + y = 5$$

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

$$3x - (3x + 5) = 5$$

$$3x - 3x - 5 = 5$$

$$-5 = 5$$



no solution

7.  $2x - 5y = 0$  and  $x - y = 3$

$$x - y = 3$$

$$x = y + 3 \rightarrow 2x - 5y = 0$$

$$2(y + 3) - 5y = 0$$

$$2y + 6 - 5y = 0$$

$$-3y = -6$$

$$y = 2 \rightarrow x - y = 3$$

$$x - 2 = 3$$

$$x = 5$$

check:  $2x - 5y = 0$

$$2(5) - 5(2) = 0$$

$$10 - 10 = 0$$

$$0 = 0 \checkmark$$

(5, 2)

8.  $y = -3x - 8$  and  $y = 15 - 2x$



$$y = 15 - 2x$$

$$-3x - 8 = 15 - 2x$$

$$-8 = 15 + x$$

$$-23 = x \rightarrow y = -3x - 8$$

$$y = -3(-23) - 8$$

$$y = 69 - 8$$

$$y = 61$$

(-23, 61)

check:  $y = 15 - 2x$

$$61 = 15 + 2(23)$$

$$61 = 15 + 46$$

$$61 = 61 \checkmark$$

9.  $y = 3x + 4$  and  $2x - 3y = 2$

$$2x - 3y = 2$$

$$2x - 3(3x + 4) = 2$$

$$2x - 9x - 12 = 2$$

$$-7x = 14$$

$$x = -2 \rightarrow y = 3x + 4$$

$$y = 3(-2) + 4$$

$$y = -6 + 4$$

$$y = -2$$

Check:  $2x - 3y = 2$

$$2(-2) - 3(-2) = 2$$

$$-4 + 6 = 2$$

$$2 = 2 \checkmark$$

**$(-2, -2)$**

10.  $y = -2x$  and  $x + 4y = 21$

$$x + 4y = 21$$

$$x + 4(-2x) = 21$$

$$x - 8x = 21$$

$$-7x = 21$$

$$x = -3 \rightarrow y = -2x$$

$$y = -2(-3)$$

$$y = 6$$

Check:  $x + 4y = 21$

$$-3 + 4(6) = 21$$

$$-3 + 24 = 21$$

$$21 = 21 \checkmark$$

**$(-3, 6)$**

11.  $6x - y = 0$  and  $8x - 3y = 25$

$$6x - y = 0$$

$$6x = y \rightarrow 8x - 3y = 25$$

$$8x - 3(6x) = 25$$

$$8x - 18x = 25$$

$$-10x = 25$$

$$x = -\frac{5}{2}$$

$$6x - y = 0 \rightarrow x = -\frac{5}{2}$$

$$6(-\frac{5}{2}) - y = 0$$

$$-15 = y$$

Check:  $8x - 3y = 25$

$$8(-\frac{5}{2}) - 3(-15) = 25$$

$$-20 + 45 = 25$$

$$25 = 25 \checkmark$$

**$(-\frac{5}{2}, -15)$**

12.  $2s + t = -3$  and  $3s + 2t = -4$

$$2s + t = -3$$

$$t = -2s - 3 \rightarrow 3s + 2t = -4$$

$$3s + 2(-2s - 3) = -4$$

$$3s - 4s - 6 = -4$$

$$-s - 6 = -4$$

$$s = -2 \rightarrow 2s + t = -3$$

$$2(-2) + t = -3$$

$$-4 + t = -3$$

$$t = 1$$

Check:  $3s + 2t = -4$

$$3(-2) + 2(1) = -4$$

$$-6 + 2 = -4$$

$$-4 = -4 \checkmark$$

**$(-2, 1)$**

13.  $y = \frac{1}{3}x + 2$  and  $2x - 6y = -12$

$$2x - 6y = -12$$

$$2x - 6(\frac{1}{3}x + 2) = -12$$

$$2x - 2x - 12 = -12$$

$$0 = 0$$

**infinite solutions**

14.  $2x = 3y + 4$  and  $6x = 9y + 8$

$$2x = 3y + 4$$

$$x = \frac{3}{2}y + 2 \rightarrow 6(\frac{3}{2}y + 2) = 9y + 8$$

$$9y + 12 = 9y + 8$$

$$12 = 8$$

**no solutions**

EXTENDING LEVEL QUESTIONS

15.  $\frac{1}{3}x - y = 3$  and  $2x + \frac{1}{2}y = 5$

$$\begin{aligned} \frac{1}{3}x - y &= 3 \\ \frac{1}{3}x - 3 &= y \rightarrow 2x + \frac{1}{2}y = 5 \\ 2x + \frac{1}{2}(\frac{1}{3}x - 3) &= 5 \\ 2x + \frac{1}{6}x - \frac{3}{2} &= 5 \\ 12x + x - 9 &= 30 \\ 13x - 9 &= 30 \\ 13x &= 39 \\ x &= 3 \\ \frac{1}{3}x - y &= 3 \\ \frac{1}{3}(3) - y &= 3 \\ 1 - y &= 3 \\ -2 &= y \\ \text{Check: } 2x + \frac{1}{2}y &= 5 \\ 2(3) + \frac{1}{2}(-2) &= 5 \\ 6 - 1 &= 5 \\ 5 &= 5 \checkmark \end{aligned}$$

$(3, -2)$

16.  $\frac{x}{2} - \frac{2y}{3} = 2$  and  $\frac{x}{4} + 3y = -4$

$$\begin{aligned} (\frac{x}{4} + 3y = -4) \cdot 4 \\ x + 12y &= -16 \\ x - 18 &= -16 \\ x &= 2 \\ (\frac{x}{2} - \frac{2y}{3} = 2) \cdot 6 \\ 3x - 4y &= 12 \\ 3(-16 - 12y) - 4y &= 12 \\ -48 - 36y - 4y &= 12 \\ -40y &= 60 \\ y &= -\frac{3}{2} \\ \text{Check: } \frac{x}{4} + 3y &= -4 \\ \frac{2}{4} + 3(-\frac{3}{2}) &= -4 \\ \frac{1}{2} - \frac{9}{2} &= -4 \\ -\frac{8}{2} &= -4 \\ -4 &= -4 \checkmark \end{aligned}$$

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

Solve the system of linear equations for  $k$  so that there are:

17. One Solution

$y = 3x + 2$  and  $y = kx + 2$

- because of same  $y$ -intercept there will be a solution.

- same  $m$ (slope) would mean infinite solutions.

so,  $k \neq 3$

Check  $k=3$   
 $3x+2=3x+2$   
 $0=0$   
 $\uparrow$   
 infinite solutions

check  $k \neq 3$   
 example  $k=2$   
 $3x+2=(2)x+2$   
 $3x=2x$   
 $x=0$   
 $\uparrow$   
 one solution

18. No Solutions

$y = 2x - 5$  and  $2x - y = k$

- because of same  $m$ (slope) the lines will never meet unless it's the same  $x$ -intercept.

so, for no solutions,  $k \neq 5$

check  $k=5$   
 $2x-5=2x-5$   
 $0=0$   
 $\uparrow$   
 infinite solutions

check  $k \neq 5$   
 example  $k=4$   
 $2x-5=2x-4$   
 $-5=-4$   
 $\downarrow$   
 no solution