

WS - Systems Review

Friday, January 11, 2013
10:54 AM

1. Solve each system by graphing. Change each equation into $y = mx + b$ if necessary.

a) $y = -x + 5$
 $y = 3x - 3$

Solution:
 $(2, 3)$

or $x = 2$
 $y = 3$

b) $x - y = 2$ $y = x - 2$
 $3x + y = -14$
 $y = -3x - 14$

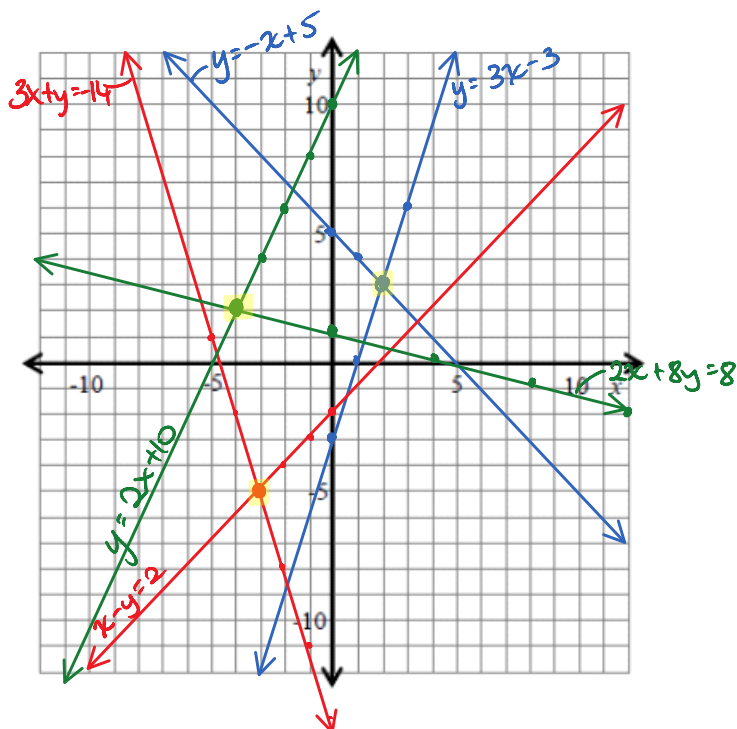
Solution $(-3, -5)$

or $x = -3$
 $y = -5$

c) $2x + 8y = 8$ $\frac{8y}{8} = \frac{-2x + 8}{8}$
 $y = 2x + 10$ $y = -\frac{1}{4}x + 1$

Solution:
 $(-4, 2)$

or $x = -4$
 $y = 2$



2. For which of the given linear systems is $(-2, 5)$ a solution? (hint: try to verify the solution for each system)

a) $3x + y = 1$
 $2x + 3y = 11$

$3(-2) + 5 = 1$
 $-6 + 5 = 1$ ✗
 \therefore not a solution

b) $5x - 3y = -5$
 $3x + 2y = 4$

$5(-2) - 3(5) = -5$
 $-10 - 15 = -5$ ✗
 \therefore not a solution

c) $-5x - 3y = -5$
 $3x + 2y = 4$

$-5(-2) - 3(5) = -5$
 $10 - 15 = -5$ ✓
 $3(-2) + 2(5) = 4$
 $-6 + 10 = 4$ ✓
 $\therefore (-2, 5)$ is a solution

d) $15x + 4y = -10$
 $25x - 6y = -80$

$15(-2) + 4(5) = -10$
 $-30 + 20 = -10$ ✓
 $25(-2) - 6(5) = -80$
 $-50 - 30 = -80$ ✓
 $\therefore (-2, 5)$ is a solution

3. Solve each system using the substitution method.

a) $x + y = 9 \rightarrow y = 9 - x$
 $2x + y = 11$

$$2x + (9 - x) = 11$$

$$x + 9 = 11$$

$$x = 2$$

$$y = 9 - 2$$

$$y = 7$$

b) $x - y = 7 \rightarrow x = 7 + y$
 $2x + y = -10$

$$2(7 + y) + y = -10$$

$$14 + 2y + y = -10$$

$$14 + 3y = -10$$

$$3y = -24$$

$$y = -8$$

$$x = 7 + (-8)$$

$$x = -1$$

c) $3x - 4y = -15$
 $5x + y = -2 \rightarrow y = -5x - 2$

$$3x - 4(-5x - 2) = -15$$

$$3x + 20x + 8 = -15$$

$$23x = -23$$

$$x = -1$$

$$y = -5(-1) - 2$$

$$y = 5 - 2$$

$$y = 3$$

d) $x + 5y = -11 \rightarrow x = -5y - 11$
 $4x - 3y = 25$

$$4(-5y - 11) - 3y = 25$$

$$-20y - 44 - 3y = 25$$

$$-23y - 44 = 25$$

$$-23y = 69$$

$$y = -3$$

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

$$x = 15 - 11$$

$$x = 4$$

4. Solve each linear system by elimination method.

a) $\begin{cases} 5(3x + 4y = 29) \\ 4(2x - 5y = -19) \end{cases} \rightarrow \begin{cases} 15x + 20y = 145 \\ 8x - 20y = -76 \end{cases}$

$$\begin{array}{r} 15x + 20y = 145 \\ + 8x - 20y = -76 \\ \hline 23x = 69 \end{array}$$

$$x = 3$$

$$3(3) + 4y = 29$$

$$9 + 4y = 29$$

$$4y = 20$$

$$y = 5$$

b) $\begin{cases} 3x + 5y = 12 \\ -(7x + 5y = 8) \end{cases}$

$$\begin{array}{r} 3x + 5y = 12 \\ -7x - 5y = 8 \\ \hline -4x = 4 \end{array}$$

$$x = -1$$

$$3(-1) + 5y = 12$$

$$-3 + 5y = 12$$

$$5y = 15$$

$$y = 3$$

$$c) \begin{cases} 2(5x+2y=5) \\ 3x-4y=-23 \end{cases} \rightarrow \begin{cases} 10x+4y=10 \\ +(3x-4y=-23) \end{cases}$$

$$13x = -13$$

$$x = -1$$

$$5(-1)+2y=5$$

$$-5+2y=5$$

$$2y=10$$

$$y=5$$

$$d) \begin{cases} 3(3x-y=5) \\ 2x+3y=10 \end{cases} \rightarrow \begin{cases} 9x-3y=15 \\ +(2x+3y=10) \end{cases}$$

$$11x = 25$$

$$x = \frac{25}{11}$$

$$3\left(\frac{25}{11}\right) - y = 5$$

$$\frac{75}{11} - y = 5$$

$$-y = \frac{55}{11} - \frac{75}{11}$$

$$-y = \frac{-20}{11}$$

$$y = \frac{20}{11}$$

5. a) Four pens cost 70 cents more than five pencils. Together, one pen and one pencil cost \$1.30. Find the cost of each pen and each pencil.

Let x = Cost of a pen
 y = Cost of a pencil

$$x+y=1.30 \rightarrow y=1.30-x$$

$$4x = 5y + 0.70$$

$$4x = 5(1.30-x) + 0.70$$

$$4x = 6.50 - 5x + 0.70$$

$$9x = 7.20$$

$$x = 0.80$$

$$y = 1.30 - 0.80$$

$$y = 0.50$$

The pens each cost \$0.80 and
the pencils each cost \$0.50

- b) The length of a rectangle is five less than three times its width. If the perimeter is 38 inches, find the rectangle's dimensions.

Let x = length
 y = width

$$x = 3y - 5$$

$$2x + 2y = 38$$

$$2(3y-5) + 2y = 38$$

$$6y - 10 + 2y = 38$$

$$8y = 48$$

$$y = 6$$

$$x = 3(6) - 5$$

$$x = 18 - 5$$

$$x = 13$$

The length is 13 inches,
and the width is 6 inches.

- c) Zachary invested part of his \$12,500 into World Oil, which paid 8% interest. He invested the other part into Sask Power, which paid 3%. If he made \$850 total, how much was invested into each fund?

let x = amount in World Oil
 y = amount in Sask Power

$$x + y = 12,500 \rightarrow y = 12,500 - x$$

$$0.08x + 0.03y = 850$$

$$0.08x + 0.03(12,500 - x) = 850$$

$$0.08x + 375 - 0.03x = 850$$

$$0.05x = 475$$

$$x = 9500$$

$$y = 12,500 - 9500$$

$$y = 3000$$

Zachary invested \$9500 into World Oil, and \$3000 into Sask Power.

- d) Kirk ran 100 m along a moving conveyor in 25 seconds, when moving against the conveyor. When running with the conveyor, it takes him 5 seconds to run the same distance. Calculate Kirk's average speed and the conveyor's average speed.

let x = Kirk's average speed
 y = conveyor's average speed

Speeds

against conveyor

$$\text{Speed} = \frac{100\text{m}}{25\text{s}} = 4\text{m/s}$$

$$x - y = 4$$

with conveyor

$$\text{Speed} = \frac{100\text{m}}{5\text{s}} = 20\text{m/s}$$

$$x + y = 20$$

$$\begin{array}{r} x - y = 4 \\ + (x + y = 20) \\ \hline 2x = 24 \end{array}$$

$$2x = 24$$

$$x = 12$$

$$12 + y = 20$$

$$y = 8$$

Kirk's average speed is 12 m/s, and the conveyor's average speed is 8 m/s.

- e) The sum of two numbers is 7. Three times one of the numbers is 15 more than the other number. Find the numbers.

let x = 1st #
 y = 2nd #

$$\begin{cases} x + y = 7 \\ 3x = y + 15 \end{cases} \rightarrow \begin{cases} x + y = 7 \\ + (3x - y = 15) \end{cases}$$

$$\frac{4x}{4} = \frac{22}{4}$$

$$x = \frac{11}{2}$$

$$\frac{11}{2} + y = 7$$

$$\frac{11}{2} + y = \frac{14}{2}$$

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

The two numbers are $\frac{11}{2}$ and $\frac{3}{2}$.

- f) Two numbers differ by 5. Four times the smaller number is 5 less than three times the larger. Find the numbers.

let x = larger #
 y = smaller #

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

$$4y = 3x - 5$$

$$4y = 3(5 + y) - 5$$

$$4y = 15 + 3y - 5$$

$$y = 10$$

$$x = 5 + 10$$

$$x = 15$$

The two numbers are 15 and 10

- g) Shana has \$1.95 in nickels and dimes. There are three more nickels than dimes. How many of each does she have?

let x = # of nickels
 y = # of dimes

$$0.05x + 0.10y = 1.95$$

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

$$0.05(3 + y) + 0.10y = 1.95$$

$$0.15 + 0.05y + 0.10y = 1.95$$

$$0.15y = 1.8$$

$$y = 12$$

$$x - 12 = 3$$

$$x = 15$$

There are 15 nickels and 12 dimes

- h) Taylor has \$4.80 in nickels and quarters. She has six more nickels than quarters. How many of each does she have?

let x = # of nickels
 y = # of quarters

$$0.05x + 0.25y = 4.80$$

$$x - y = 6 \rightarrow x = 6 + y$$

$$0.05(6 + y) + 0.25y = 4.80$$

$$0.3 + 0.05y + 0.25y = 4.80$$

$$0.3y = 4.5$$

$$y = 15$$

$$x = 6 + 15$$

$$x = 21$$

There are 21 nickels and 15 quarters.