

Name: Key

Unit 3 Review – Systems of Equations

Helpful Information:

The solution(s) to a system of equations is where the graphs intersect

2 x 2 Systems

Solutions contain (x,y)

Look for multiple solutions

Can be solved algebraically or graphically

3 x 3 Systems

Solutions contain (x,y,z)

Look for a single solution

Only solved *algebraically* w/ elimination method

Level I Practice:

1. When $g(x) = \frac{2}{x+2}$ and $h(x) = \log(x+1) + 3$ are graphed on the same set of axes, which coordinates best approximate their point of intersection?

1) (-0.9, 1.8)

2) (-0.9, 1.9)

3) (1.4, 3.3)

4) (1.4, 3.4)

Calculator
 $y_1 = \frac{2}{x+2}$
 $y_2 = \log(x+1) + 3$
graph

2nd calc
5: intersect
X = -0.926921
Y = 1.863795
≈ 1.9

2. Solve the following system of equations algebraically:

① $-5x - y - 4z = 60$

② $2x + 4y + 3z = -12$

③ $6x - 3y - 2z = -52$

1+2
 $4(-5x - y - 4z = 60)$
 $2x + 4y + 3z = -12$

1+3
 $-3(-5x - y - 4z = 60)$
 $6x - 3y - 2z = -52$

Skip question

3. Solve the following system of equations algebraically:

$$\begin{array}{r} 3x + 4y = 8 \rightarrow 3x + 4y = 8 \\ -3(x - 3y = -6) \rightarrow -3x + 9y = 18 \\ \hline 13y = 26 \\ 13 \quad 13 \\ \hline y = 2 \end{array}$$

$$\begin{array}{r} y = 2 \\ 3x + 4(2) = 8 \\ 3x + 8 = 8 \\ -8 \quad -8 \\ \hline 3x = 0 \\ x = 0 \end{array}$$

$$\begin{array}{r} \text{Check } (0, 2) \\ x - 3y = -6 \\ 0 - 3(2) = -6 \\ -6 = -6 \end{array}$$

Ans (0, 2)

Level II Practice:

4. Which value, to the nearest tenth, is not a solution of $p(x) = q(x)$ if $p(x) = x^3 + 3x^2 - 3x - 1$ and $q(x) = 3x + 8$?

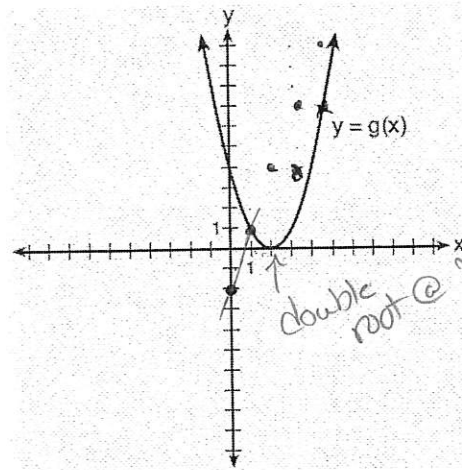
- 1) -3.9
- 2) -1.1
- 3) 2.1
- 4) 4.7

calc
2nd Calc- σ : Intersect

$$\begin{array}{ccc} x = -3.94 & x = -1.1 & x = 2.05 \\ -3.9 & -1.1 & = 2.1 \end{array}$$

SO 4.7 is not

5. What is the solution to the system of equations $y = 3x - 2$ and $y = g(x)$ where $g(x)$ is defined by the function below?



- 1) $\{(0, -2)\}$
- 2) $\{(0, -2), (1, 6)\}$
- 3) $\{(1, 6)\}$
- 4) $\{(1, 1), (6, 16)\}$

6. Solve the following system of equations algebraically:

Solution: $a = -3, b = -2, c = -4$

$$\begin{aligned} \textcircled{1} \quad & 4a + 5b - 6c = 2 \\ \textcircled{2} \quad & -3a - 2b + 7c = -15 \\ \textcircled{3} \quad & -a + 4b + 2c = -13 \end{aligned}$$

1 + 3 for a

$$\begin{aligned} 4a + 5b - 6c &= 2 \rightarrow 4a + 5b - 6c = 2 \\ 4(-a + 4b + 2c = -13) &\rightarrow -4a + 16b + 8c = -52 \\ \hline \textcircled{4} \quad & 21b + 2c = -50 \end{aligned}$$

2 + 3 for a

$$\begin{aligned} -3a - 2b + 7c &= -15 \rightarrow -3a - 2b + 7c = -15 \\ -3(-a + 4b + 2c = -13) &\rightarrow 3a - 12b - 6c = 39 \\ \hline \textcircled{5} \quad & -14b + 1c = 24 \end{aligned}$$

4 + 5 for c

$$\begin{aligned} 21b + 2c &= -50 \rightarrow 21b + 2c = -50 \\ -2(-14b + 1c = 24) &\rightarrow 28b - 2c = -48 \\ \hline 49b &= -98 \\ \hline \boxed{b = -2} \end{aligned}$$

Level III Practice:

7. Solve the system of equations shown below algebraically.

$$(x-3)^2 + (y+2)^2 = 16$$

$$2x + 2y = 10 \rightarrow 2x + 2y = 10$$

Check

w/ (7, -2)

$$(x-3)^2 + (y+2)^2 = 16$$

$$(7-3)^2 + (-2+2)^2 = 16$$

$$\begin{aligned} 4^2 + 0 &= 16 \\ 16 &= 16 \checkmark \end{aligned}$$

w/ (3, 2)

$$(3-3)^2 + (2+2)^2 = 16$$

$$\begin{aligned} 0 + 4^2 &= 16 \\ 16 &= 16 \checkmark \end{aligned}$$

Ans $\{ (7, -2), (3, 2) \}$

Check w/

$$a = -3, b = -2, c = -4$$

$$\textcircled{2} \quad -3(-3) - 2(-2) + 7(-4) = -15$$

$$\begin{aligned} 9 + 4 - 28 &= -15 \\ -15 &= -15 \checkmark \end{aligned}$$

$$\textcircled{3} \quad -(-3) + 4(-2) + 2(-4) = -13$$

$$\begin{aligned} 3 - 8 - 8 &= -13 \\ -13 &= -13 \checkmark \end{aligned}$$

use 4 w/ $b = -2$

$$21b + 2c = -50$$

$$21(-2) + 2c = -50$$

$$-42 + 2c = -50$$

$$2c = -8$$

$$\boxed{c = -4}$$

use 1 w/ $b = -2, c = -4$

$$4a + 5b - 6c = 2$$

$$4a + 5(-2) - 6(-4) = 2$$

$$4a - 10 + 24 = 2$$

$$4a + 14 = 2$$

$$\begin{array}{r} 4a + 14 = 2 \\ -14 \quad -14 \\ \hline 4a = -12 \end{array}$$

$$\boxed{a = -3}$$

Check in other eq
See way above

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

$$y = 5 - x$$

$$(x-3)^2 + (5-x+2)^2 = 16$$

$$x^2 - 6x + 9 + (7-x)^2 = 16$$

$$x^2 - 6x + 9 + 49 - 14x + x^2 = 16$$

$$\begin{array}{r} 2x^2 - 20x + 58 = 16 \\ -16 \quad -16 \\ \hline 2x^2 - 20x + 42 = 0 \end{array}$$

$$\frac{2x^2}{2} - \frac{20x}{2} + \frac{42}{2} = \frac{0}{2}$$

$$x^2 - 10x + 21 = 0$$

$$(x-7)(x-3) = 0$$

$$x = 7 \mid x = 3$$

$$x = 7 \quad (7, -2)$$

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

$$14 + 2y = 10$$

$$\begin{array}{r} 14 + 2y = 10 \\ -14 \quad -14 \\ \hline 2y = -4 \end{array}$$

$$y = -2$$

$$x = 3$$

$$2(3) + 2y = 10$$

$$6 + 2y = 10$$

$$\begin{array}{r} 6 + 2y = 10 \\ -6 \quad -6 \\ \hline 2y = 4 \end{array}$$

$$y = 2$$

$$(3, 2)$$

8. A friend e-mails you the results of a recent high school swim meet. The e-mail states that 24 individuals placed, earning a combined total of 53 points. First place earned 3 points, second place earned 2 points, and third place earned 1 point. There were as many first place finishers as second and third place finishers combined.

a. Write a system of three equations to represent how many people finished in each place.

$$\begin{aligned} \textcircled{1} \quad & x + y + z = 24 \\ \textcircled{2} \quad & 3x + 2y + z = 53 \\ \textcircled{3} \quad & x = y + z \end{aligned}$$

$x = 1\text{st place}$
 $y = 2\text{nd place}$
 $z = 3\text{rd place}$

b. How many swimmers finished in first place, second place, and third place, respectively?

$$\begin{array}{r} 1 \text{ d } 3 \\ x + y + z = 24 \\ \uparrow \\ x = y + z \\ \hline y + z + y + z = 24 \\ \textcircled{4} \quad 2y + 2z = 24 \end{array}$$

$$\begin{array}{r} 2 \text{ d } 3 \\ 3x + 2y + z = 53 \\ \uparrow \\ x = y + z \\ \hline 3(y + z) + 2y + z = 53 \\ 3y + 3z + 2y + z = 53 \\ \textcircled{5} \quad 5y + 4z = 53 \end{array}$$

$$\begin{array}{r} \textcircled{4+5} \\ -2(2y + 2z = 24) \rightarrow -4y - 4z = -48 \\ 5y + 4z = 53 \rightarrow 5y + 4z = 53 \\ \hline \boxed{y = 5} \end{array}$$

$$\begin{array}{r} \textcircled{4} \quad y = 5 \\ 2(5) + 2z = 24 \\ 10 + 2z = 24 \\ 2z = 14 \\ \boxed{z = 7} \end{array}$$

$$\begin{array}{r} \textcircled{3} \quad x = y + z \\ x = 5 + 7 \\ \boxed{x = 12} \end{array}$$

Check
 eq 1 $\rightarrow x + y + z = 24$
 $12 + 5 + 7 = 24$
 $24 = 24 \checkmark$

eq. 2 $\rightarrow 3x + 2y + z = 53$
 $3(12) + 2(5) + 7 = 53$
 $36 + 10 + 7 = 53$
 $53 = 53 \checkmark$

Ans. $12 \rightarrow 1\text{st place}$
 $5 \rightarrow 2\text{nd place}$
 $7 \rightarrow 3\text{rd place}$