

Unit 3 / Day 3

More Solving Systems of Equations Algebraically & Graphically

Objective:

Students will solve systems of equations representing lines, parabolas and circles both algebraically and graphically.

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EX #1: Consider the graph below as you answer the following questions.

- a. Find the equation of the parabola and label it $f(x)$.

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

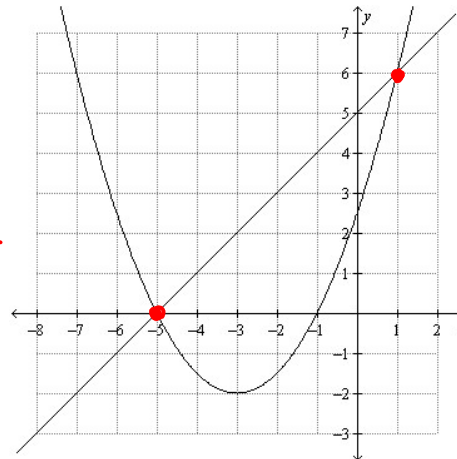
$$0 = a(-1+3)^2 - 2$$

$$2 = 4a$$

$$a = \frac{1}{2} \quad f(x) = \frac{1}{2}(x+3)^2 - 2$$

- b. Find the equation of the line and label it $g(x)$.

$$g(x) = x + 5$$



- c. Use the graph to solve the system.

$$(-5, 0) \quad (1, 6)$$

d. Solve the same system algebraically.

$$\begin{cases} y = \frac{1}{2}(x+3)^2 - 2 \\ y = x + 5 \end{cases}$$

$$\frac{1}{2}(x+3)^2 - 2 = x + 5$$

$$2 \cdot \frac{1}{2}(x+3)^2 = (x+7) \cdot 2$$

$$(x+3)(x+3)$$

$$x^2 + 6x + 9 = 2x + 14$$

$$x^2 + 4x - 5 = 0$$

$$\begin{array}{r} -5 \\ 5 \end{array} \begin{array}{r} / \\ \times \\ / \\ -1 \\ 4 \end{array}$$

$$(x+5)(x-1) = 0$$

$$x = -5 \quad x = 1$$

$$y = 0 \quad y = 6$$

$(-5, 0)$
 $(1, 6)$

e. Use your graph to solve $f(x) = 0$.

$y = 0$ x-int

$(-5, 0)$ $x = -5$
 $(-1, 0)$ $x = -1$

f. Use your graph to solve $g(x) = 0$.

$x = -5$

g. How could you change the equation of the parabola so that the parabola and the line do not intersect? (Think of at least two ways.)

move it up (increase k)
 make a negative

EX #2: Solve the following system algebraically.

$$\begin{cases} y = \frac{-6}{x-3} - 2 \\ y = -3x + 10 \end{cases}$$

$$\frac{-6}{x-3} - 2 = -3x + 10$$

~~$$\frac{-6}{x-3} = -3x + 12$$~~

$$-6 = (x-3)(-3x+12)$$

$$-6 = -3x^2 + 12x + 9x - 36$$

$$3x^2 - 21x + 30 = 0$$

$$\frac{3(x^2 - 7x + 10) = 0}{3}$$

$$x^2 - 7x + 10 = 0$$

~~$$\begin{array}{r} -5 \\ -7 \end{array} - 2$$~~

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

$$x = 5 \quad x = 2$$

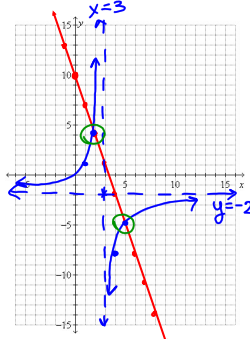
$$y = -3(5) + 10 \quad y = -3(2) + 10$$

$$y = -5 \quad y = 4$$

$$(5, -5) \quad (2, 4)$$

EX #2: Solve the following system graphically.

$$\begin{cases} y = \frac{-6}{x-3} - 2 \\ y = -3x + 10 \end{cases}$$



$x+3$	x	y	$-6y-2$
1	-2	$-\frac{1}{2}$	1
2	-1	-1	4
3	0	undefined	
4	1	1	-8
5	2	$\frac{1}{2}$	-5

$$(5, -5) \quad (2, 4)$$

EX #3: Solve the following system algebraically.

$$\begin{cases} y = 2\sqrt{x+4} - 5 \\ x - y = 4 \end{cases}$$

$x - (2\sqrt{x+4} - 5) = 4$
 $x - 2\sqrt{x+4} + 5 = 4$
 $x - 2\sqrt{x+4} = -1$
 $-x + 2\sqrt{x+4} = -1$ $(-x-1)(-x-1)$
 $(-2\sqrt{x+4})^2 = (-x-1)^2$
 $4(x+4) = x^2 + 2x + 1$
 $4x + 16 = x^2 + 2x + 1$
 $x^2 - 2x - 15 = 0$

$$\begin{array}{r} -15 \\ -5 \quad 3 \\ \hline -2 \end{array}$$

 $(x-5)(x+3) = 0$
 $x = 5 \quad x = -3$
 $5 - y = 4 \quad -3 - y = 4$
 $y = 1 \quad -y = 7$
 $y = -7 \leftarrow \text{ext.}$
 $(5, 1) \quad (-3, -7)$

EX #3: Solve the following system graphically.

$$\begin{cases} y = 2\sqrt{x+4} - 5 \\ x - y = 4 \end{cases}$$

$-y = -x + 4$
 $y = x - 4$

$x-4$	x	y	$2y-5$
-4	0	0	-5
-3	1	1	-3
0	4	2	-1
5	9	3	1
12	16	4	3

Ans: (5, 1)

EX #4: Solve the following system algebraically.

$$\begin{cases} y = -6(3)^x + 7 \\ 2x + y = 1 \end{cases}$$

$$y = -2x + 1$$

$$-2x + 1 = -6(3)^x + 7$$

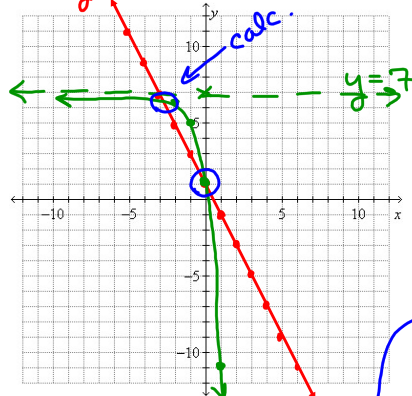
$$\frac{-2x - 6}{-6} = \frac{-6(3)^x}{-6}$$

$$\frac{1}{3}x + 1 = 3^x \rightarrow \text{exp, means we're stuck}$$

EX #4: Solve the following system graphically.

$$\begin{cases} y = -6(3)^x + 7 \\ 2x + y = 1 \end{cases}$$

$$y = -2x + 1$$



$-\frac{2}{3} + 7$

$-\frac{6}{1} \cdot \frac{1}{3} = -\frac{6}{3}$

3^x

x	y	-6y + 7
-2	$\frac{1}{9}$	$6\frac{2}{3}$
-1	$\frac{1}{3}$	5
0	1	1
1	3	-11
2	9	-47

(0, 1)
(-2.872, 6.744)

2nd calc intersect
enter, enter, guess (get close)



Sep 18-10:27 AM