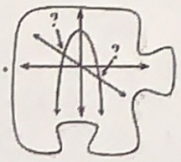
Teacher Notes

3.1.3 How many solutions are there? Notes



Multiple Solutions to Systems of Equations

You have used many different algebraic and graphical strategies to solve equations with one variable. You have also worked with systems of equations with two variables. In this lesson, you will use your algebraic strategies and graphing tools to determine the number of solutions that various systems of equations have and to determine the meaning of those solutions.

NOTES:

Solving Systems of Equations Algebraically

Ex. 1) $y = 2x + 4$
$y = 4x - 2$

$2x+4=4x-2$
$-2x \quad -2x$
$4 = 2x - 2$
$+2 \quad +2$
$\frac{6}{2} = \frac{2x}{2}$
$x = 3$

Ex. 2) $6y + 2x = 5$
$y = 2x - 1$

$6(2x-1)+2x=5$
$12x-6+2x=5$
$14x-6=5$
$+6 \quad +6$
$\frac{14x}{14} = \frac{11}{14}$
$x = \frac{11}{14}$

3-45.

Solve each system of equations algebraically. For each one, explain what the solution (or lack thereof) tells you about the graph of the system.

a. $y = -3x + 5$
$y = -3x - 1$

$-3x+5=-3x-1$
$+3x \quad +3x$
$5 \neq -1$
↑ not true so
no solution

b. $y = \frac{1}{2}x^2 + 1$
$y = 2x - 1$

$\frac{1}{2}x^2+1=2x-1$
$-2x \quad -2x$
$\frac{1}{2}x^2-2x+1=-1$
$+1 \quad +1$
$2\left(\frac{1}{2}x^2-2x+2\right)=(0)2$
↑ to get rid of fraction
$x^2-4x+4=0$

→ Factor:

	x	-2
x	x^2	$-2x$
-2	$-2x$	4

$(x-2)(x-2)=0$
$x-2=0 \quad x-2=0$
$+2 \quad +2 \quad +2 \quad +2$
$x=2 \quad x=2$

c. $y^2 = x$
$y = x - 2$

	x	-2
x	x^2	$-2x$
-2	$-2x$	4

↑ multiply
$(x-2)^2=x$
$x^2-4x+4=x$
$-x \quad -x$
$x^2-5x+4=0$

→ Factor:

	x	-4
x	x^2	$-4x$
-1	$-1x$	4

$(x-4)(x-1)=0$
$x-4=0 \quad x-1=0$
$x=4 \quad x=1$

d. $4x - 2y = 10$
$y = 2x - 5$

$4x-2(2x-5)=10$
$4x-4x+10=10$
$10=10$ ✓ true so
infinitely many solutions
(same line)

3-46.

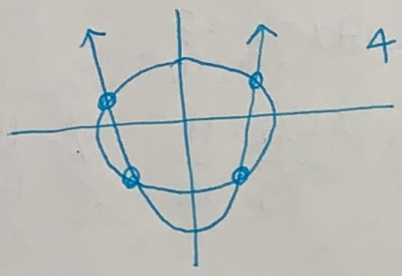
Now consider the system shown below:

$$x^2 + y^2 = 25$$
$$y = x^2 - 13$$

a. How many solutions do you expect this system to have? Explain how you made your prediction.

"Guesses may vary"

b. Solve this system by graphing. How many solutions do you see? Was your prediction in part (a) correct?



4 solutions: (4,3), (-4,3), (-3,-4) & (3,-4)