Name: ______________________ Date: ______________________ Hour: ____Alg 1____

Unit 7A Day 8: The Relationship between Solutions to Equations and Graphs

Focus Question: What does solving an equation tell me about a graph?

A. Review

1. Without graphing, tell **everything** you know about the following functions

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

parent moved down 3, left 1
vertically compressed
parabola
vertex $(-1,-3)$
a.o.s. $x=-1$
open up
y int when $x=0$ $(0, -\frac{8}{3})$
2 x int.

b. $g(x) = -2|x-3| + 4$

vertex $(3,4)$
parent moved up 4 right 3
reflected over x
open down
a.o.s. $x=3$
vertically stretched
"V" abs value
y int $(0,-2)$
2 x int.

2. Solve each of the following

a. $|x| = 5$

$\boxed{x=5 \quad x=-5}$

$\boxed{x=\pm5}$

b. $x^2 = 9$

$\boxed{x=\pm3}$

$\boxed{x=3 \quad x=-3}$

c. $|x-6| = 2$

$x-6=2$ or $x-6=-2$
$+6 \quad +6 \qquad +6 \quad +6$

$\boxed{x=8}$ $\boxed{x=4}$

d. $\sqrt{(x-2)^2} = \sqrt{16}$

±4

$x-2=4$ or $x-2=-4$
$+2 \quad +2 \qquad +2 \quad +2$

$\boxed{x=6}$ $\boxed{x=-2}$

B. Solutions

1. Solve

PEMDAS

a. $\frac{1}{3}(x+1)^2 - 3 = 0$

$+3 \quad +3$

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

$\sqrt{(x+1)^2} = \sqrt{9}$

$x+1 = \pm3$

$x+1=3$
$-1 \quad -1$

$x+1=-3$
$-1 \quad -1$

$\boxed{x=2}$ or $\boxed{x=-4}$

b. $-2|x-3| + 4 = 0$

$-4 \quad -4$

$\frac{-2|x-3|}{-2} = \frac{-4}{-2}$

$|x-3| = 2$

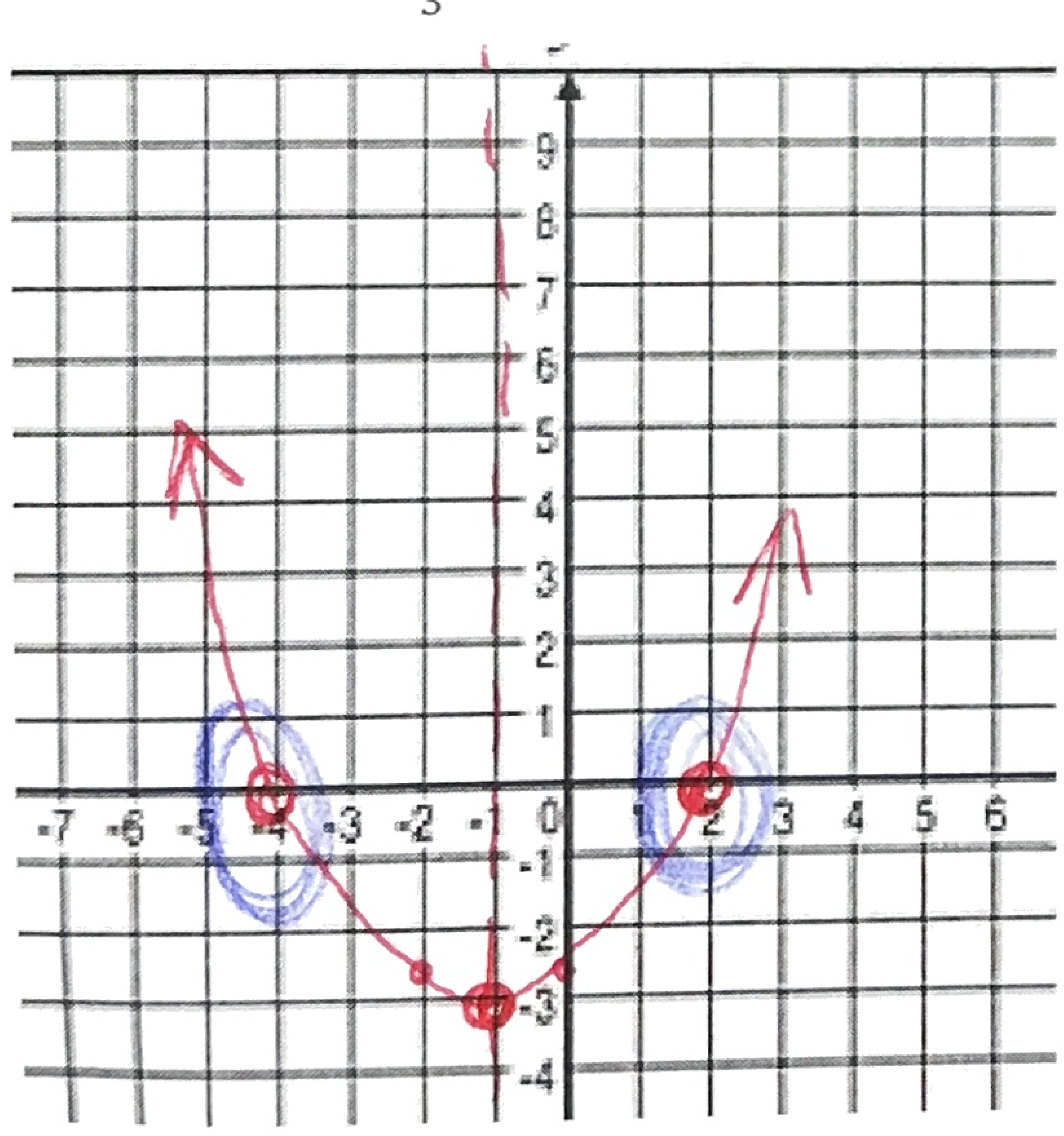
$x-3=2$ or $x-3=-2$
$+3 \quad +3 \qquad +3 \quad +3$

$\boxed{x=5}$ $\boxed{x=1}$

2. Graph

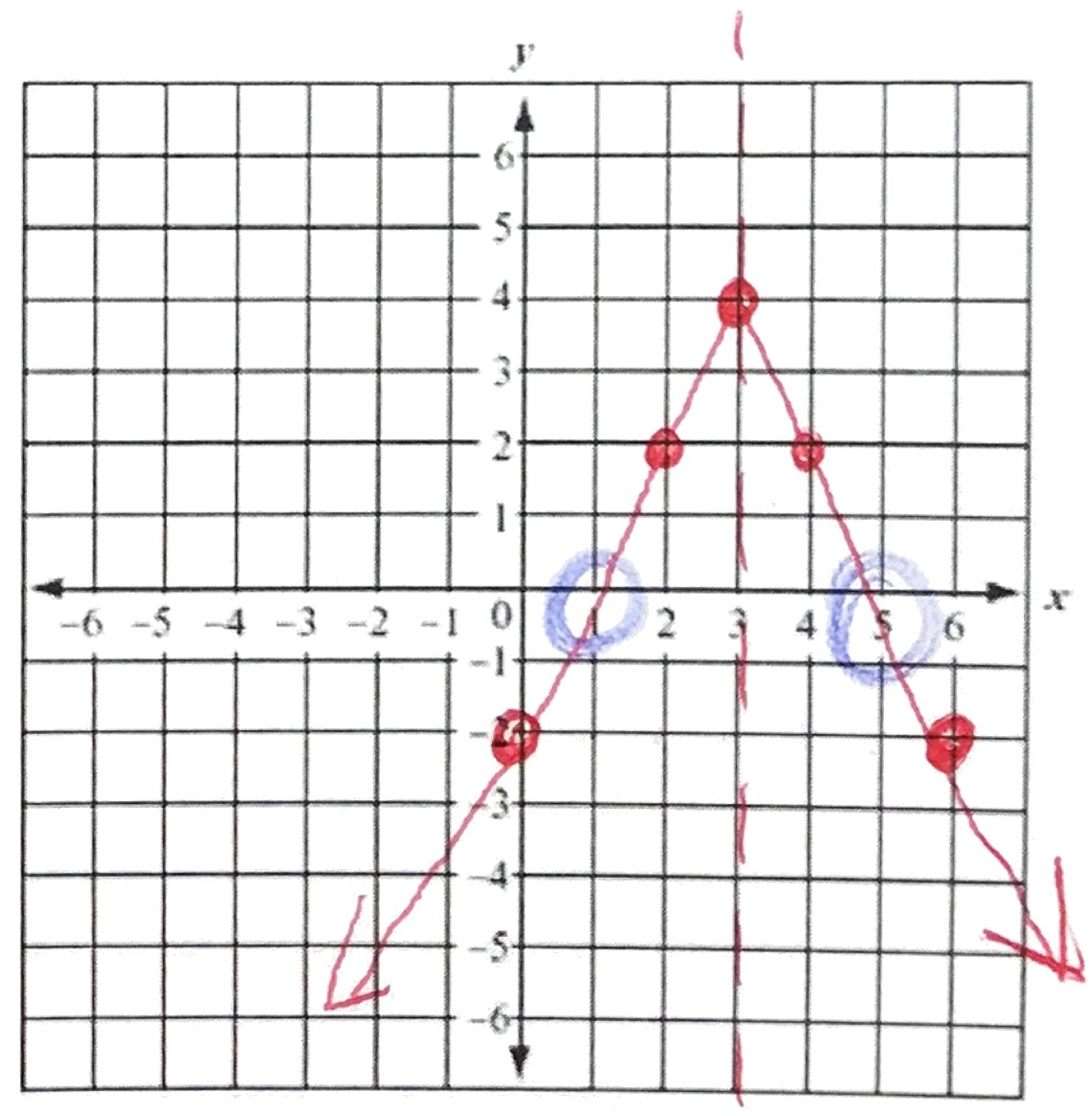
a. $f(x) = \frac{1}{3}(x+1)^2 - 3$

x	y
2	0



b. $g(x) = -2|x-3| + 4$

x	y
2	2



3. What do you notice about your answers to #1 and #2?

The solutions are the x intercepts.

The following terms all refer to the same idea:

Solve the function **X intercepts** **Solutions** **Zeros** **Roots**

To **solve a function**, you set the function equal **to zero**, and find the **solutions**. In the process of finding the **solutions**, you take some "**root**" of the number which is what causes multiple **solutions**. These **solutions** are the **x-intercepts** when the function is graphed (because remember you set f(x), or y, equal to **zero**).

4. Solve $0 = (x+1)^2 - 4$

$+4 \quad +4$

$\sqrt{4} = \sqrt{(x+1)^2}$

$\pm 2 = x+1$

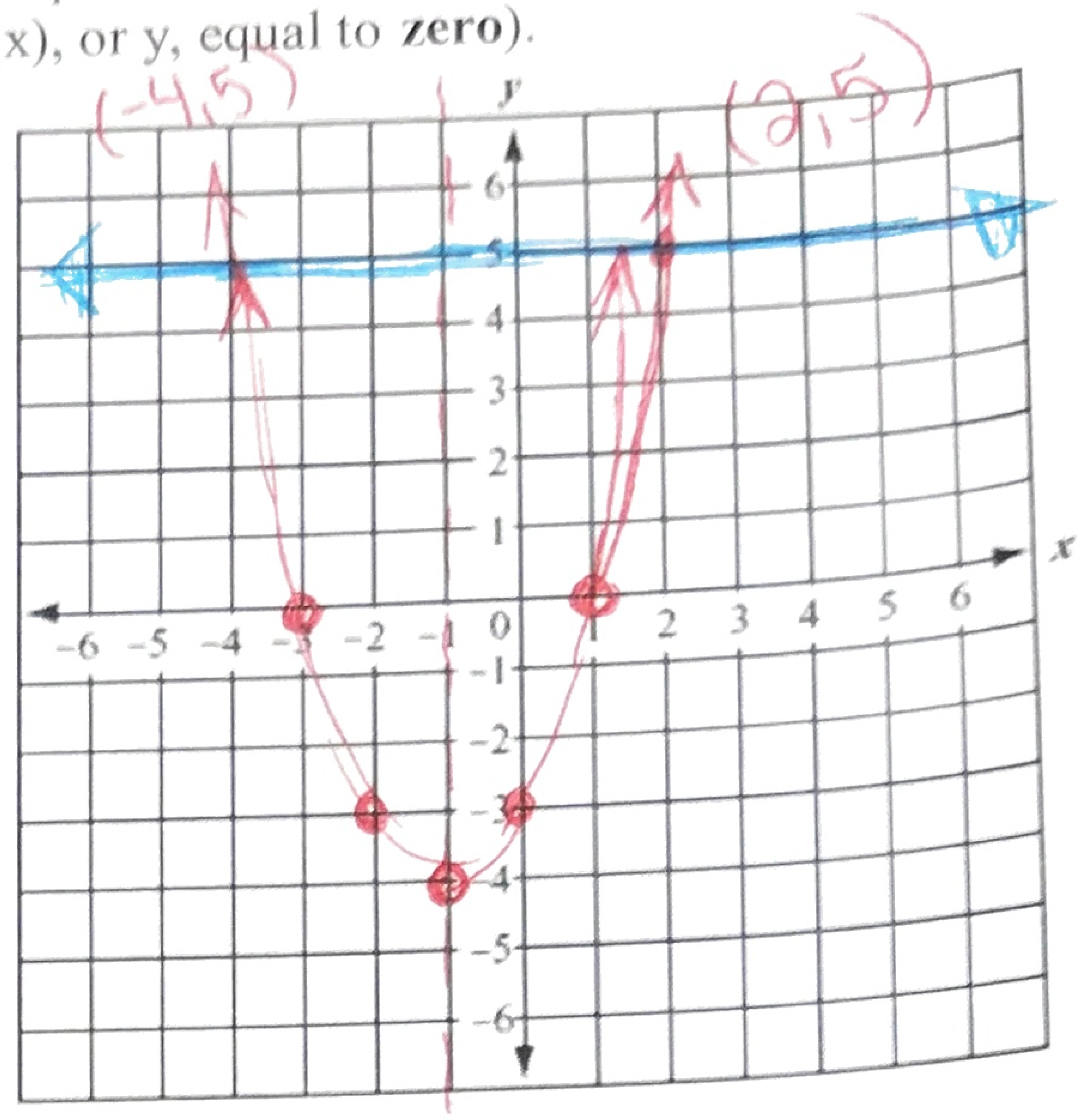
$2 = x+1$ or $-2 = x+1$

$-1 \quad -1 \qquad -1 \quad -1$

$\boxed{1 = x}$ $\boxed{-3 = x}$

5. Graph $f(x) = (x+1)^2 - 4$

vertex(-1,-4)



6. Solving for a value. You can find other values beside f(x) = 0 by replacing f(x) with the given value.

a. Use the graph above to find f(x) = 5 b. Solve the equation $(x+1)^2 - 4 = 5$

$+4 \quad +4$

$\sqrt{(x+1)^2} = \sqrt{9}$

$x+1 = \pm 3$

$x+1 = 3$ $x+1 = -3$

$-1 \quad -1 \qquad -1 \quad -1$

$\boxed{x = 2 \text{ or } x = -4}$

c. How is this related to solving a system of equations?

- graphing ✓
- substitution ✓
- elimination

2 or more equations & see where they intersect

7. Solve each of the following and explain why the answer makes sense based on the equation had it been graphed.

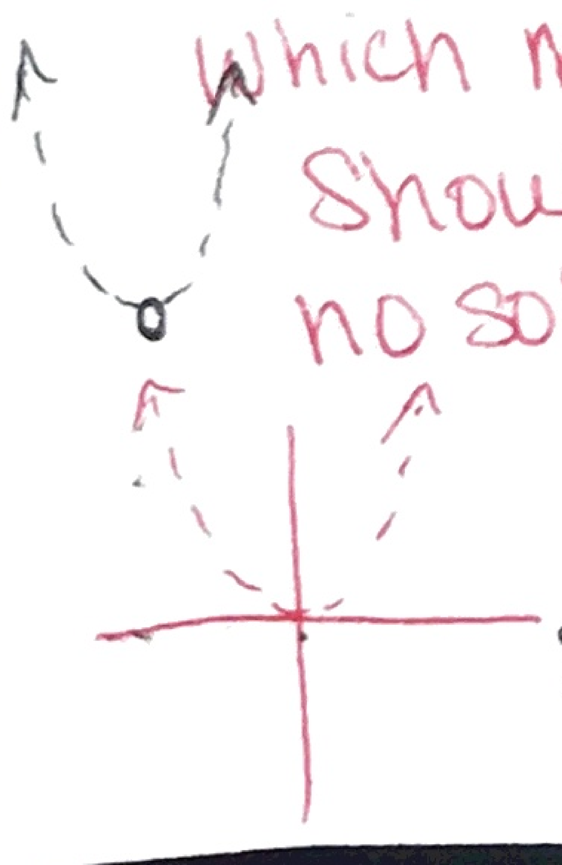
a. $(x+2)^2 + 9 = 0$

$-9 \quad -9$

$\sqrt{(x+2)^2} = \sqrt{-9}$

$x+2 =$ we don't know YET!

which means it should have no sol'ns (xint)



left 2 & up 9 so no xint makes sense

b. $|x+6| = 0$

$x+6 = 0$

$-6 \quad -6$

$x = -6$

which means 1 xint

there's only 1 xint

c. $-|x-4| - 8 = -5$

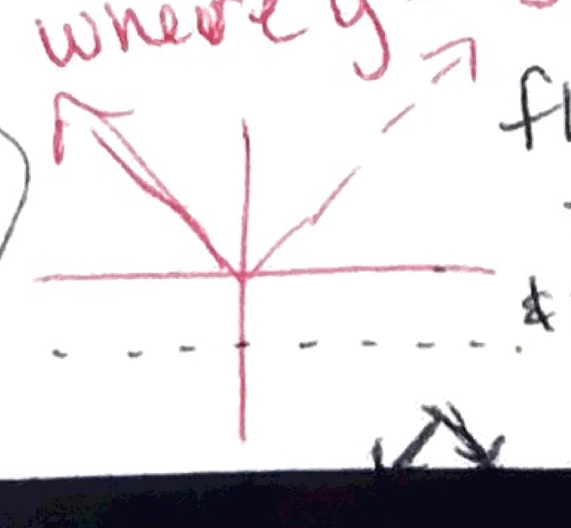
$+8 \quad +8$

$-|x-4| = 3$

$-1 \qquad -1$

$|x-4| = -3$

Abs. value can't be negative so there are no places where y = -5



flip over x-axis & move right 4 & down 8

d. $-3x^2 + 12 = 0$

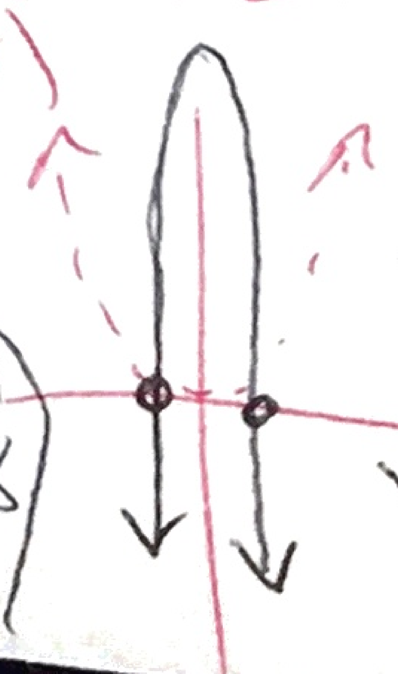
$-12 \quad -12$

$\frac{-3x^2}{-3} = \frac{-12}{-3}$

$\sqrt{x^2} = \sqrt{4}$

$x = \pm 2$

There are 2 solutions (xint)



flip over x up 12 vert. str.