Name: KEY   Hour: _____   Date: _____

NOTES: Section 9.7 – Using the Discriminant

Goals: #1 - I can use the discriminant to determine the number of solutions of a quadratic equation.

Homework: Section 9.7 Worksheet   😎   😬   🥴

Warm Up: Use the quadratic formula to solve the equation. Write your answer in simplest radical form.

1. $4x^2 - 8x = -3$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$\underset{a}{4x^2} \underset{b}{-8x} + \underset{c}{3} = 0$

$$x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(4)(3)}}{2(4)}$$

$$x = \frac{8 \pm \sqrt{64 - 48}}{8}$$

$$x = \frac{8 \pm \sqrt{16}}{8}$$
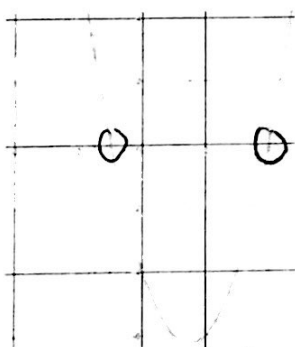
$$x = \frac{8 \pm 4}{8}$$

$$x = \frac{8+4}{8} = \frac{12}{8} = \boxed{\frac{3}{2}}$$

$$x = \frac{8-4}{8} = \frac{4}{8} = \boxed{\frac{1}{2}}$$

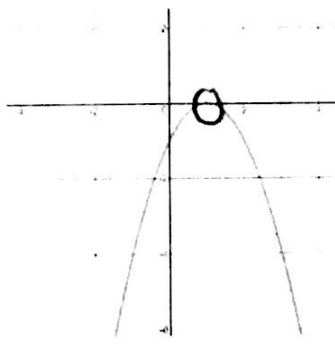**Exploration #1:** Work with a partner and answer the following questions.

1. Use the graph to identify the solutions of the quadratic equation:
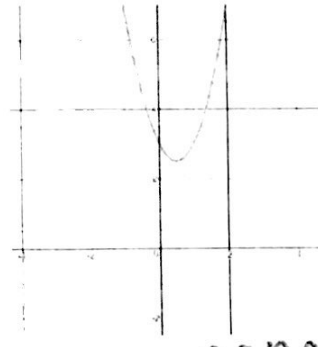
    a. $y = x^2 - 3x - 4$ b. $y = -x^2 + 2x - 1$ c. $y = 2x^2 - 2x + 3$

solution/s: $-1, 4$ solution/s: 1 solution/s: none

2. Find the value of $b^2 - 4ac$ for these quadratic equations:

    a. $y = \underset{a}{x^2} \underset{b}{- 3x} \underset{c}{- 4}$ b. $y = \underset{a}{-x^2} \underset{b}{+ 2x} \underset{c}{- 1}$ c. $y = \underset{a}{2x^2} \underset{b}{- 2x} \underset{c}{+ 3}$

$(-3)^2 - 4(1)(-4)$ $(2)^2 - 4(-1)(-1)$ $(-2)^2 - 4(2)(3)$

$9 + 16$ $4 - 4$ $4 - 24$

$\boxed{25}$ $\boxed{0}$ $\boxed{-20}$
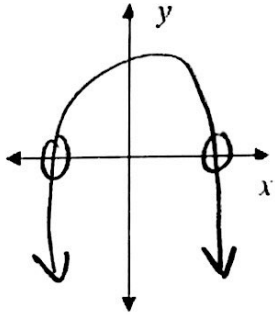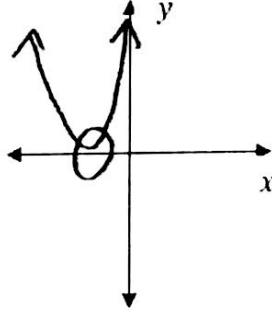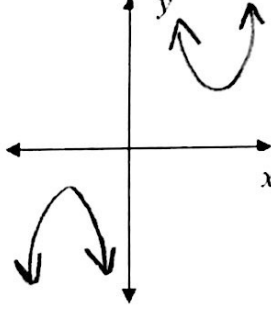
Notes:

In the quadratic formula, the expression $\underline{b^2-4ac}$ is called the $\underline{discriminant}$ of the quadratic equation.

$$x = \frac{-b \pm \sqrt{\boxed{b^2 - 4ac}}}{2a} \; discriminant$$

We can use the $\underline{discriminant}$ of a quadratic equation to determine the equation's $\underline{number}$ and $\underline{type}$ of $\underline{solutions}$.

Value of discriminant	$+$	0	$-$
Number and type of solutions	2 solutions	1 solution	no real solutions
Graph of $y = ax^2 + bx + c$			

Example #1: Find the value of the discriminant. Then use the value to determine whether the equation has *two solutions, one solution,* or *no real solution.*

1. $\overset{a}{x^2} \overset{b}{-} 3x \overset{c}{+} 4 = 0$

$(-3)^2 - 4(1)(4)$

$9 - 16$

$\boxed{-7}$

$\boxed{no\ real\ solution}$

2. $2x^2 = 8x - 8$

$\overset{a}{2x^2} \overset{b}{-} 8x \overset{c}{+} 8 = 0$

$(-8)^2 - 4(2)(8)$

$64 - 64$

$\boxed{0}$

$\boxed{one\ solution}$

3. $\overset{a}{x^2} \overset{b}{-} 5x \overset{c}{+} 4 = 0$

$(-5)^2 - 4(1)(4)$

$25 - 16$

$\boxed{9}$

$\boxed{two\ solutions}$

You practice: Find the value of the discriminant. Then use the value to determine whether the equation has *two solutions*, *one solution*, or *no real solution*.

1. $x^2 + 3 = 0$

$(0)^2 - 4(1)(3)$

$0 - 12$

$\boxed{-12}$

$\boxed{\text{no real solution}}$

2. $x^2 - 6x = 13$

$x^2 - 6x - 13 = 0$

$(-6)^2 - 4(1)(-13)$

$36 + 52$

$\boxed{88}$

$\boxed{\text{two solutions}}$

3. $x^2 - 2x + 1 = 0$

$(-2)^2 - 4(1)(1)$

$4 - 4$

$\boxed{0}$

$\boxed{\text{one solution}}$