Name ______________________________ Date ____________________

Notes 10-4 and 10-5

Solving Equations of the Form $ax^2+bx+c=0$ and the Quadratic Formula

Recall: From the previous section that we can find the vertex of a parabola by inspection if the quadratic equation is in the form $y=(x-h)^2+k$ where (h,k) is the vertex.

Zeros- where the parabola crosses the x-axis.

We can find the **zeros** of the function by substituting y=0 into any quadratic function. There are 4 ways to solve (find the zeros) of a quadratic function.
1. Graphing and inspection of x-intercepts
2. Factoring and Zero Product Property
3. Completing the Square and Solving for variable.
4. Quadratic Formula

We've practiced factoring a lot, so let's try **Completing the Square**.

Ex #1:

$y=x^2-6x+7$

$0=x^2-6x+7$

$-7=x^2-6x$

$-7+\left(\frac{-6}{2}\right)^2=x^2-6x+\left(\frac{-6}{2}\right)^2$

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

$2=(x-3)^2$

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

$\sqrt{2}=x-3$

$3\pm\sqrt{2}=x$

Ex #2:

$x^2+x=2$

$x^2+x+\left(\frac{1}{2}\right)^2=2+\left(\frac{1}{2}\right)^2$

$x^2+x+\frac{1}{4}=\frac{9}{4}$

$\left(x+\frac{1}{2}\right)^2=\frac{9}{4}$

$\sqrt{\left(x+\frac{1}{2}\right)^2}=\sqrt{\frac{9}{4}}$

$x+\frac{1}{2}=\pm\frac{3}{2}$

$x=1$

$x=-2$

You try one.

$y=x^2+2x-3$

Do you think you have a handle on solving quadratics by completing the square?

Name ________________________ Date ______________

The Quadratic Formula

Recall: The standard form of a quadratic equation is:

$$y = ax^2 + bx + c$$

***In order to solve **ANY** quadratic equation the equation **MUST** be set equal to 0. ***

MEMORIZE THIS FORMULA:

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

The a, b, and c in the formula come from the standard form of a quadratic equation.

How do we use it?

Ex #1.

$x^2 - 7x = 8$

$x^2 - 7x - 8 = 0$

$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(1)(-8)}}{2(1)}$

$x = \frac{7 \pm \sqrt{49 + 32}}{2}$

$x = \frac{7 \pm \sqrt{81}}{2}$

$x = \frac{7 \pm 9}{2}$

$x = 8$

$x = -1$

Ex #2.

$y = 3x^2 + 2x - 4$

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

$x = \frac{-2 \pm \sqrt{4 + 48}}{6}$

$x = \frac{-2 \pm \sqrt{52}}{6}$

$x \approx .87$

$x \approx -1.54$

Ex #3.

$x^2 = 14 + 9x$

There's something special about the quadratic formula…
It can tell us a lot about the parabola itself.

Name ______________________________ Date ____________________

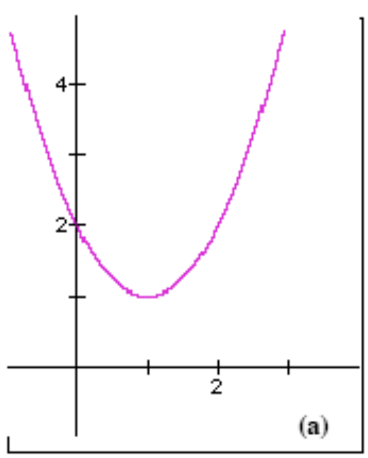
Hidden inside the quadratic formula is $b^2 - 4ac$
This is called **The Descriminant**.

The discriminant tells us how many and what type of solutions the quadratic equation has.

If $b^2 - 4ac \succ 0$, then there are two real solutions.

If $b^2 - 4ac = 0$, then there is only one real solution.

If $b^2 - 4ac \prec 0$, then there are no real solutions.



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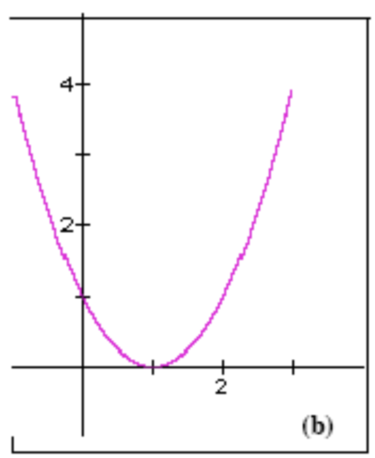

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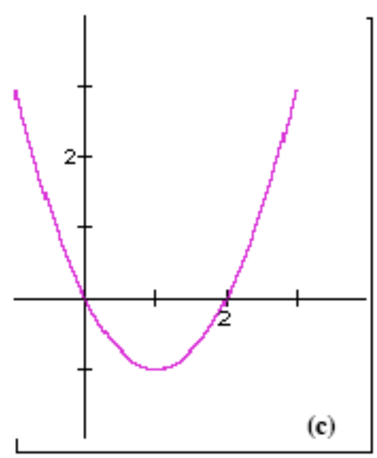

#3.

Notice how many x-intercepts each graph has. Which situation matches each graph?

Now tell me how many and what type of solutions does the quadratic function $y = 3x^2 - 2x + 5$ have?

Name ______________________________ Date ____________________

Classwork: Pg. 502

29.	31.
37.	41.

Pg 509

5.	9.
10.	11.

Name ___________________________ Date ________________

Homework: Pg 502

28.	32.
42.	44.

Pg 510

16.	22.
26.	41.