Name___________________ Date__________

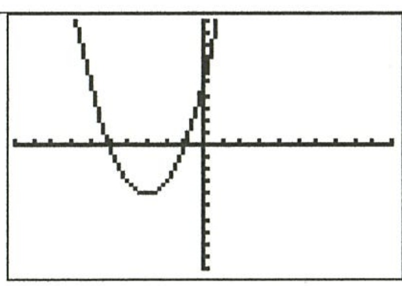
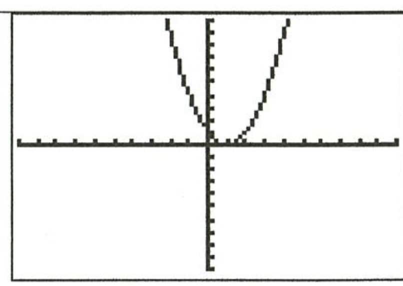
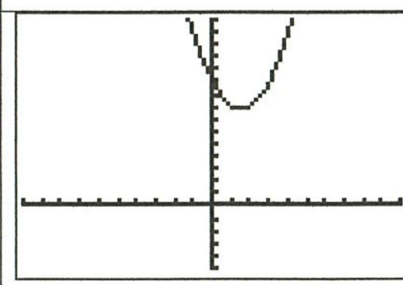
8A; Algebra 1 Period______

Discriminant

The **discriminant** is the name given to the expression that appears under the square root (radical) sign in the quadratic formula.

Quadratic Formula:	**Discriminant**
$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	$b^2 - 4ac$

The discriminant tells you about the "nature" of the roots of a quadratic equation given that *a, b* and *c* are rational numbers. It quickly tells you the number of real roots, or in other words, the number of *x*-intercepts, associated with a quadratic equation.

Equation	$x^2 + 6x + 5 = 0$	$x^2 - 2x + 1 = 0$	$x^2 - 3x + 10 = 0$
Discriminant	a = 1, b = 6, c =5 $b^2 - 4ac$ $(6)^2 - 4(1)(5)$ 36 - 20 16 The discriminant is **positive**	a = 1, b = - 2, c =1 $b^2 - 4ac$ $(-2)^2 - 4(1)(1)$ 4 - 4 0 The discriminant is **zero**	a = 1, b = -3, c =10 $b^2 - 4ac$ $(-3)^2 - 4(1)(10)$ 9 - 40 -31 The discriminant is **negative**
Number of Solutions	Two real soutions	One real solution	No real solutions
Graph of Roots	 **There are two *x*-intercepts.**	 **There is one *x*-intercept.**	 **There are no *x*-intercepts.**
Roots found using the Quadratic Equation	$x = \dfrac{-6 \pm \sqrt{6^2 - 4(1)(5)}}{2(1)}$ $x = \dfrac{-6 \pm \sqrt{16}}{2} = \dfrac{-6 \pm 4}{2}$ $x = -1; \quad x = -5$ **There are two real roots**	$x = \dfrac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(1)}}{2(1)}$ $x = \dfrac{2 \pm \sqrt{0}}{2} = 1$ $x = 1; \quad x = 1$ **There is one real root**	$x = \dfrac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(10)}}{2(1)}$ $x = \dfrac{3 \pm \sqrt{-31}}{2}$ $x = \dfrac{3 + i\sqrt{31}}{2}; \quad x = \dfrac{3 - i\sqrt{31}}{2}$ **There are two complex roots.**

So.....

If $b^2 - 4ac > 0$, the equation has two real solutions **

If $b^2 - 4ac = 0$, the equation has one real solutions

If $b^2 - 4ac < 0$, the equation has no real solutions

**If the discriminant is a perfect square, the two roots are rational numbers. If the discriminant is not a perfect square, the two roots are irrational numbers containing a radical.

Examples: Find the number of real solutions of each equation using the discriminant

1) $3x^2 + 10x + 2 = 0$

2) $2x^2 + 12x = -18$

3) $x^2 + x + 1 = 0$

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

5) $2x^2 - 2x + 3 = 0$

6) $9x^2 - 7x + 1 = 0$