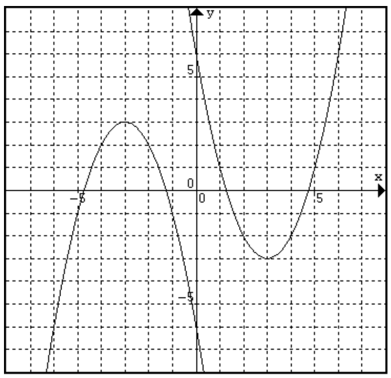
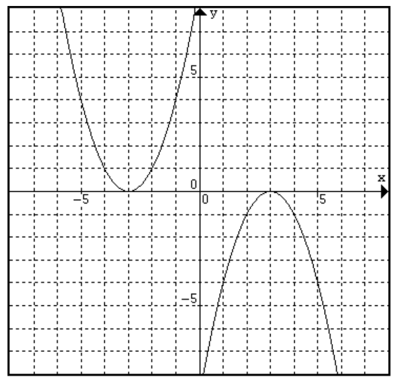
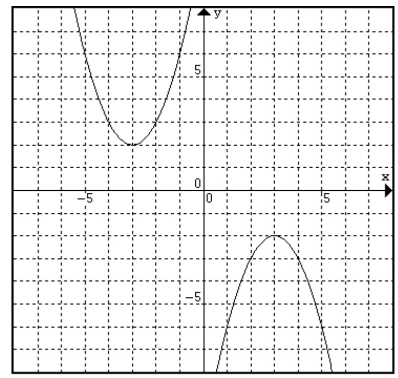
Zeros of a Quadratic – The Discriminant

Recall that the "zeros" of a **quadratic function** (**$y = ax^2 + bx + c$**) refer to the **x-intercepts** of the graph.

Two Zeros (Two x-intercepts)	**One Zero (One x-intercept)**	**No Zeros (No x-intercepts)**
		

Zeros are the *x-values* that solve a **quadratic equation** (**$ax^2 + bx + c = 0$**). The method used to determine ***how many zeros*** a quadratic function has depends on the *form* of the equation.

1. Factored Form - $y = a(x-r)(x-s)$

$y = 3(x-4)(x+2)$ …solving for ***x*** produces *x* = ____ , *x* = ____ ∴ _______ zeros

$f(x) = -2x(x-5)$ …solving for ***x*** produces *x* = ____ , *x* = ____ ∴ _______ zeros

$y = 2(x+4)^2$ …solving for ***x*** produces *x* = ____ , *x* = ____ ∴ _______ zeros

2. **Vertex Form -** $y = a(x-h)^2 + k$

To determine the number of zero's… find the **vertex**, determine the **direction of opening** and **sketch** (if necessary).

$y = 2(x-4)^2 - 3$ … Vertex (4, –3) ; a = 2

⇒ The vertex is **below** the x-axis; parabola opens ______ ∴ _____ zeros

$y = -2(x-4)^2 - 3$ … Vertex (4, –3) ; a = –2

⇒ The vertex is **below** the x-axis; parabola opens ______ ∴ _____ zeros

$y = 2(x+4)^2$ … Vertex (4, 0) ; a = 2

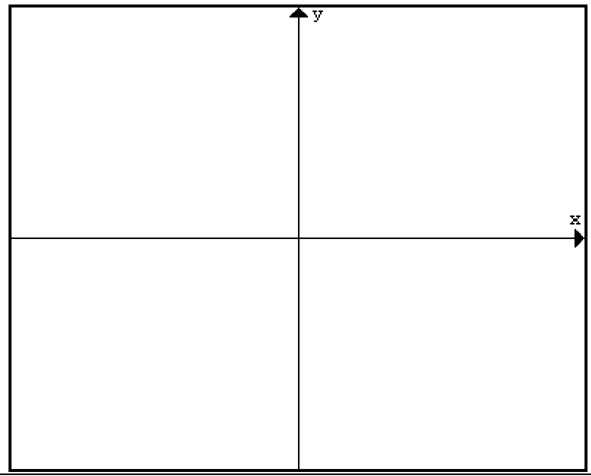
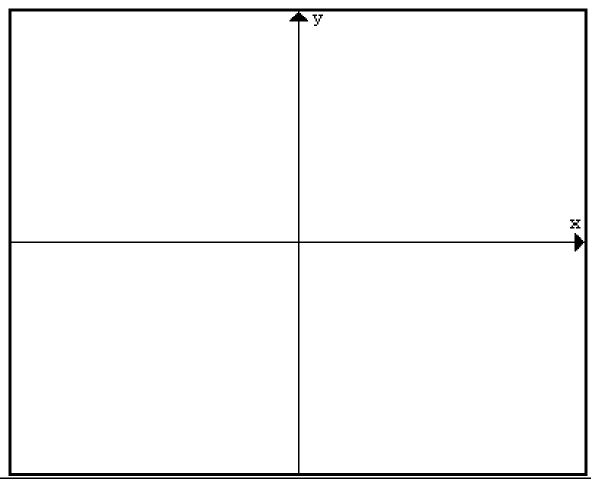
⇒ The vertex is **on** the x-axis; parabola opens ______ ∴ _____ zeros

3. **Standard Form -** $y = ax^2 + bx + c$

To determine the ***number of zeros*** we can use the **quadratic formula**… $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

OR

Use the graphing calculator to **sketch** the parabola.

Equation	**Roots**	**Sketch**
$4x^2 - 2x - 3 = 0$	$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	
$5x^2 - 12x + 9 = 0$	$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	
$x^2 - 2x + 1 = 0$	$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$