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

The discriminant is the part of the quadratic formula under the square root symbol: **b^2-4ac.**
The discriminant tells us whether there are two solutions, one solution, or no real solutions.

- The discriminant formula is used to determine the nature of the roots (x-intercepts) of a quadratic equation.
- The discriminant (**D**) of a quadratic equation is the part under the square root (sum of everything under the square root):

$$\mathbf{D} = b^2 - 4ac$$

RULES:
If **D** > 0; the equation has two real distinct roots.
If **D** = 0; the equation has only one real root.
If **D** = a negative number; there are no real roots

If **D** > 0 ⇒ 2 solutions

$x = \frac{-5 \pm \sqrt{4}}{4}$ $x = \frac{-3}{4}$ $x = \frac{-7}{4}$

One root will use the positive square root of four($+\sqrt{4}$) and the other will use the negative square root of four($-\sqrt{4}$), so there will be two roots.

If **D** = 0 ⇒ 1 solution

$x = \frac{-4 \pm \sqrt{0}}{4}$ $x = -1$

Since the positive or negative square root of zero($+\sqrt{0}$ or $-\sqrt{0}$) is zero, there will be only one root.

If **D** = -# ⇒ No solutions

$x = \frac{-5 \pm \sqrt{-4}}{4}$ *No Solutions*

Since it is not possible to take the square root of a negative number($\sqrt{-4}$), there are no real roots.

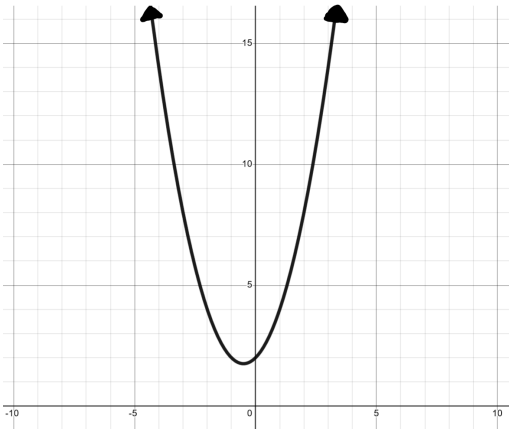
D = b^2 - 4ac
a b c

$y = 6x^2 + 10x - 1$	$y = 4x^2 + 8x + 4$	$y = 3x^2 + 7x + 10$
a = 6, b = 10, c = -1	a = 4, b = 8, c = 4	a = 3, b = 7, c = 10
$b^2 - 4ac$	$b^2 - 4ac$	$b^2 - 4ac$
$10^2 - 4(6)(-1)$	$8^2 - 4(4)(4)$	$7^2 - 4(3)(10)$
$100 + 24$	$64 - 64$	$49 - 120$
124	0	-71
⇒ **Two Solutions**	⇒ **One Solution**	⇒ **Zero Real Solutions**

If **D** = -# ⇒ No solutions

$$x = \frac{-5 \pm \sqrt{-4}}{4}$$

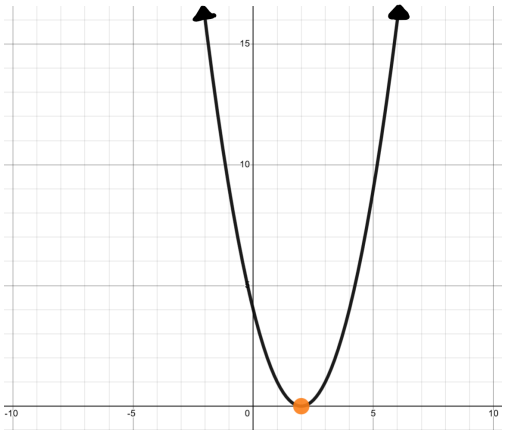
$x^2 + x + 2$ --- No solutions



If **D** = 0 ⇒ One solution

$$x = \frac{-4 \pm \sqrt{0}}{4}$$

$x^2 - 4x + 4$ --- One solution



If D = 0 ⇒ Two solutions

$$x = \frac{-5 \pm \sqrt{4}}{4}$$

$x^2 - 7x + 3$ --- Two solutions