

3. Lauren is solving the quadratic equation $x^2 - 7x - 8 = 3$.

Her work is shown.

- a. Identify Lauren's error.
- b. Use the Quadratic Formula correctly to determine the solution to Lauren's quadratic equation. Classify the solutions as rational or irrational.

Lauren



$$x^2 - 7x - 8 = 3$$

$$a = 1, b = -7, c = -8$$

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

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

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

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

$$x = \frac{7 + 9}{2} \quad \text{or} \quad x = \frac{7 - 9}{2}$$

$$x = \frac{16}{2} = 8 \quad \text{or} \quad x = \frac{-2}{2} = -1$$

The roots are 8 and -1.

$$y = x^2$$

$$y = x^2 - 1$$

$$y = x^2 + 1$$

$$\frac{-(0) \pm \sqrt{(0)^2 - 4(1)(0)}}{2(1)}$$

$$\frac{-(0) \pm \sqrt{(0)^2 - 4(1)(-1)}}{2(1)}$$

$$\frac{-(0) \pm \sqrt{(0)^2 - 4(1)(1)}}{2(1)}$$

$$x = 0$$

$$x = -1, 1$$

$$x = \frac{\sqrt{-4}}{2}$$

1. Use the Quadratic Formula to solve each quadratic equation.
Show your work.

Because this portion of the formula “discriminates” the number of real zeros, or roots, it is called the **discriminant**.

3. Using the discriminant, write an inequality to describe when a quadratic function has each solution.

a. no real roots/zeros

$$\text{if, } b^2 - 4ac < 0$$

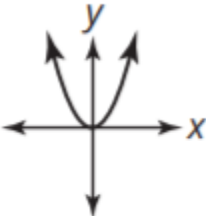
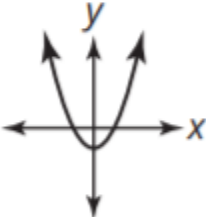
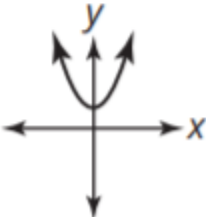
b. one unique real root/zero

$$\text{if, } b^2 - 4ac = 0$$

c. two unique real roots/zeros

$$\text{if, } b^2 - 4ac > 0$$

The diagram is set against a light purple background. At the top, the text "The discriminant" is written. Below it, the expression $B^2 - 4AC$ is enclosed in a red rectangular box. A red arrow points from the bottom right corner of this box down to the radical part of the quadratic formula below. The quadratic formula is $x = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$. The entire radical term $\sqrt{B^2 - 4AC}$ is circled in red. Below the formula, the text "Quadratic formula" is written.

Equation/ Function	Solutions	Number of Unique Real Zeros	Number of x-Intercepts	Sketch
$f(x) = x^2$	$x = \frac{-0 \pm \sqrt{0^2 - 4(1)(0)}}{2(1)}$ $= \frac{0 \pm \sqrt{0}}{2}$ $= 0 \pm \sqrt{0}$	1	1	
$g(x) = x^2 - 1$	$x = \frac{-0 \pm \sqrt{0^2 - 4(1)(-1)}}{2(1)}$ $= \frac{0 \pm \sqrt{4}}{2}$ $= 0 \pm 1$	2	2	
$h(x) = x^2 + 1$	$x = \frac{-0 \pm \sqrt{0^2 - (4)(1)(1)}}{2(1)}$ $= \frac{0 \pm \sqrt{-4}}{2}$	0	0	

4. Use the discriminant to determine the number of real roots for each equation. Then solve for the roots/zeros.

a. $y = 2x^2 + 12x - 2$

$$\begin{array}{l} (12)^2 - 4(2)(-2) \\ 144 + 16 \\ 160 \end{array} \quad \begin{array}{l} 2 \text{ real} \\ \text{irrational} \\ \text{solutions} \end{array}$$

c. $y = x^2 + 12x + 36$

$$\begin{array}{l} (12)^2 - 4(1)(36) \\ 144 - 144 \\ 0 \end{array} \quad \begin{array}{l} 1 \text{ real} \\ \text{rational} \\ \text{solutions} \end{array}$$

e. $y = 4x^2 - 9$

$$\begin{array}{l} (0)^2 - 4(4)(-9) \\ 144 \end{array} \quad \begin{array}{l} 2 \text{ real} \\ \text{rational} \\ \text{solutions} \end{array}$$

b. $0 = 2x^2 + 12x + 20$

$$\begin{array}{l} (12)^2 - 4(2)(20) \\ 144 - 160 \\ -16 \end{array} \quad \begin{array}{l} \text{no real} \\ \text{solutions!} \end{array}$$

d. $y = 3x^2 + 7x - 20$

$$\begin{array}{l} (7)^2 - 4(3)(-20) \\ 49 + 240 \\ 289 \end{array} \quad \begin{array}{l} 2 \text{ real} \\ \text{rational} \\ \text{solutions} \end{array}$$

f. $0 = 9x^2 + 12x + 4$

$$\begin{array}{l} (12)^2 - 4(9)(4) \\ 144 - 144 \\ 0 \end{array} \quad \begin{array}{l} 1 \text{ real} \\ \text{rational} \\ \text{solutions} \end{array}$$

$$b^2 - 4ac$$