

4.7 Honors Quadratic Formula

Objective: Solve quadratic equations by using the quadratic formula.

Quadratic Formula

The Solutions (Zeros) of the quadratic equation $ax^2 + bx + c = 0$ are:

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

all do same thing { Quadratic Formula
Completing Square
Factoring / Zero Product Property

Examples

Solve each equation using the quadratic formula. Find the exact solution, then approximate the solution to the nearest hundredth.

$a=4$ $b=-8$ $c=1$
① $4x^2 - 8x + 1 = 0$

$$x = \frac{8 \pm \sqrt{64 - 4(4)(1)}}{2(4)}$$

$$= \frac{8 \pm \sqrt{48}}{8} = \frac{8 \pm 4\sqrt{3}}{8}$$

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

$$x = 1.87, 0.13$$

$a=3$ $b=6$ $c=-10$
② $-3y^2 = 6y - 10$ $0 = 3y^2 + 6y - 10$

$$y = \frac{-6 \pm \sqrt{36 - 4(3)(-10)}}{2(3)}$$

$$= \frac{-6 \pm \sqrt{156}}{6} = \frac{-6 \pm 2\sqrt{39}}{6}$$

$$= \frac{-3 \pm \sqrt{39}}{3}$$

$$y = 1.08, -3.08$$

Solve the equation using the quadratic formula. Find the exact solution.

3. $x^2 + 8x + 19 = 0$ $a=1$ $b=8$ $c=19$

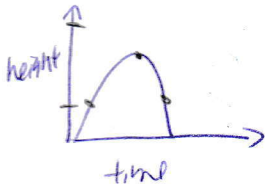
$$x = \frac{-8 \pm \sqrt{64 - 4(1)(19)}}{2(1)}$$

$$= \frac{-8 \pm \sqrt{-12}}{2} = \frac{-8 \pm 2i\sqrt{3}}{2}$$

$$= 4 \pm i\sqrt{3}$$

4. The equation $h = -16t^2 + 80t$ models the height h in feet reached in t seconds propelled straight up from the ground. When will the object be at a height of 70 feet? Solve your answer with a graphing calculator.

Window
 $X(-, a)$
 Scale 1
 $y(-5, 115)$
 Scale 5



70 = $-16t^2 + 80t$
 $16t^2 - 80t + 70 = 0$

$$t = \frac{80 \pm \sqrt{6400 - 4(16)(70)}}{2(16)} = \frac{-80 \pm \sqrt{1920}}{-32} = \begin{matrix} 1.13 \text{ sec} \\ 3.87 \text{ sec} \end{matrix}$$

Discriminant

The discriminant of the quadratic equation in the form $ax^2 + bx + c = 0$ is $b^2 - 4ac$. Circle the place in the quadratic formula where you find the discriminant.

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

You can use the discriminant to determine the number and type of solutions a quadratic equation has.

Value of Discriminant	positive	zero	negative
Number and type of solutions	2 real	1 real	2 imaginary
Number of x-intercepts	2	1	0
Graph of $y = ax^2 + bx + c$			

Do problem 30 on worksheet in class

Examples

Find the discriminant and give the number and type of solutions of the equation. $a=8$ $b=8$ $c=3$

5. $x^2 - 8x + 16 = 0$
 $a=1$ $b=-8$ $c=16$
 $b^2 - 4ac = 64 - 4(1)(16)$
 $= 0$
 1 real solution

6. $8p^2 + 8p = -3$
 $8p^2 + 8p + 3 = 0$
 $b^2 - 4ac = 64 - 4(8)(3)$
 $= -32$
 2 imaginary solutions