Algebra 2

Ch. 5 Handout 5.8

The Quadratic Formula

The quadratic formula is derived by completing the square on a quadratic equation.

Quadratic Formula

A quadratic equation written in standard form $ax^2 + bx + c = 0$ can be solved with the Quadratic Formula.

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

http://teachertube.com/viewVideo.php?video_id=93575&title=Quadratic_Formula_Song_and_Dance

1. Use the quadratic formula to solve

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

$a = 3 \quad b = -5 \quad c = -2$

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

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(3)(-2)}}{2(3)}$$

$$x = \frac{5 \pm \sqrt{25 + 24}}{6}$$

$$x = \frac{5 \pm \sqrt{49}}{6}$$

$$x = \frac{5 \pm 7}{6}$$

$$x = \frac{5+7}{6} = \frac{12}{6} \qquad x = 2$$

$$x = \frac{5-7}{6} = \frac{-2}{6} \qquad x = -\frac{1}{3}$$

b) $3x^2 + 2x = -4$

$3x^2 + 2x + 4 = 0$

$a = 3 \quad b = 2 \quad c = 4$

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

$$x = \frac{-2 \pm \sqrt{(2)^2 - 4(3)(4)}}{2(3)}$$

$$x = \frac{-2 \pm \sqrt{4 - 48}}{6}$$

$\sqrt{-1 \cdot 4 \cdot 11}$

$$x = \frac{-2 \pm \sqrt{-44}}{6}$$

$$x = \frac{-2 \pm 2i\sqrt{11}}{6}$$

$$x = \frac{-2}{6} \pm \frac{2i\sqrt{11}}{6}$$

$$x = -\frac{1}{3} \pm \frac{i\sqrt{11}}{3}$$

OR

$$x = -\frac{1}{3} + \frac{i\sqrt{11}}{3}$$

$$x = -\frac{1}{3} - \frac{i\sqrt{11}}{3}$$

1. Use the quadratic formula to solve

c) $x^2 + 4x = 41$

$x^2 + 4x - 41 = 0$

$a = 1 \quad b = 4 \quad c = -41$

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

$$x = \frac{-4 \pm \sqrt{(4)^2 - 4(1)(-41)}}{2(1)}$$

$$x = \frac{-4 \pm \sqrt{16 + 164}}{2}$$

$$x = \frac{-4 \pm \sqrt{180}}{2} \qquad \sqrt{36 \cdot 5}$$

$$x = \frac{-4 \pm 6\sqrt{5}}{2}$$

$$x = \frac{-4}{2} \pm \frac{6\sqrt{5}}{2}$$

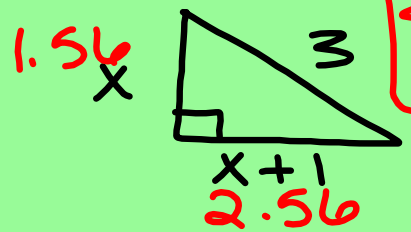
$$\boxed{x = -2 \pm 3\sqrt{5}}$$

2. The longer leg of a right triangle is 1 unit longer tha the shorter leg. The hypotenuse is 3 units long. What i the length of the shorter leg?

$a^2 + b^2 = c^2$

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

$(x+1)(x+1)$



Shorter Leg $\approx$ 1.56

$x^2 + x^2 + 2x + 1 = 9$

$-9 \quad -9$

$2x^2 + 2x - 8 = 0$

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

$a = 2$

$b = 2$

$c = -8$

$4 + 64$

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

$x = \frac{-2 \pm \sqrt{68}}{4}$

$x = \frac{-2 + \sqrt{68}}{4}$ $\quad x \approx 1.56$

$x = \frac{-2 - \sqrt{68}}{4}$ $\quad x \not\approx -2.56$

4. A player throws a ball up and toward a wall that is 17 ft high. The height h in feet of the ball t seconds after it leaves the player's and is modeled by $h = -16t^2 + 25t + 6$. If the ball makes it to where the wall is, will it go over the wall or hit the wall?

Use the quadratic formula to solve each equation.

5. $3x^2 - x = 4$

6. $-2x^2 = 4x + 3$

Use the quadratic formula to solve each equation.

7. $x^2 + 10x = -25$

Discriminant of a Quadratic Equation

The discriminant of a quadratic equation in the form $ax^2 + bx + c = 0$ is the value of the expression $b^2 - 4ac$

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

Value of the Discriminant	Type and Number of Solutions for $ax^2 + bx + c = 0$	Examples of Graphs of Related functions $y = ax^2 + bx + c$
$b^2 - 4ac > 0$	two real solutions	two x-intercepts
$b^2 - 4ac = 0$	one real solution	one x-intercept
$b^2 - 4ac < 0$	no real solution two imaginary solutions	no x-intercept

Determine the type and number of solutions of

9. $2x^2 - 5x + 7 = 0$

10. $-3x^2 + 14x - 8 = 0$

Determine the type and number of solutions of

11. $4x^2 - 5x + 10 = 7x + 1$

Assignment:

Day 1: Pgs 293-295 1-37 odds