Key

Solving Quadratic Equations by Using the Quadratic Formula

Class Notes

Simplify: means
1. add/subtract

1. $\dfrac{-3 \pm \sqrt{25}}{8}$ 1. $\dfrac{(-3+\sqrt{25})}{8} = 0.25$ 2. $\dfrac{-2 \pm \sqrt{40}}{6}$ 1. $\dfrac{(-2+\sqrt{40})}{6} \approx 0.72$

$\boxed{\{-1, 0.25\}}$ 2. $\dfrac{(-3-\sqrt{25})}{8} = -1$ $\boxed{\{-1.39, 0.72\}}$ 2. $\dfrac{(-2-\sqrt{40})}{6} \approx -1.39$

3. $\dfrac{-6 \pm \sqrt{24}}{2}$ 1. $\dfrac{(-6+\sqrt{24})}{2} \approx -0.55$ 4. $\dfrac{5 \pm \sqrt{17}}{2}$ 1. $\dfrac{(5+\sqrt{17})}{2} \approx 4.56$

$\boxed{\{-0.55, -5.45\}}$ 2. $\dfrac{(-6-\sqrt{24})}{2} \approx -5.45$ $\boxed{\{0.44, 4.56\}}$ 2. $\dfrac{(5-\sqrt{17})}{2} \approx 0.44$

The Quadratic Formula – The solutions of a quadratic equation in the form $ax^2 + bx + c = 0$, where $a \neq 0$, are given by the formula

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

The quadratic formula can be used to solve any quadratic equation involving any variable. The value of $b^2 - 4ac$ must be a nonnegative. If $b^2 - 4ac$ is negative, the equation has no real roots.

Examples:

Solve each equation by using the quadratic formula. Approximate irrational roots to the nearest hundredth.

1. $x^2 - 2x - 24 = 0$ Set Up: $\dfrac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-24)}}{2(1)}$

$a = \underline{1}$

$b = \underline{-2}$

$c = \underline{-24}$ $\dfrac{2 \pm \sqrt{100}}{2} = \dfrac{2 \pm 10}{2}$

$\boxed{\{-4, 6\}}$ ① $\dfrac{2+10}{2} = 6$ ② $\dfrac{2-10}{2} = -4$

Formula: $\dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$

2. $x^2 + 10x + 12 = 0$

a = 1
b = 10
c = 12

$= \dfrac{-(10) \pm \sqrt{(10)^2 - 4(1)(12)}}{2(1)}$

$0 = \dfrac{-10 \pm \sqrt{52}}{2}$

① $\dfrac{(-10 + \sqrt{52})}{2} \approx \boxed{-1.39}$

② $\dfrac{(-10 - \sqrt{52})}{2} \approx \boxed{-8.61}$

$\boxed{\{-8.61, -1.39\}}$

3. $5y^2 - y - 4 = 0$

a = 5
b = -1
c = -4

$= \dfrac{-(-1) \pm \sqrt{(-1)^2 - 4(5)(-4)}}{2(5)}$

$0 = \dfrac{1 \pm \sqrt{81}}{10}$

$0 = \dfrac{1 \pm 9}{10}$

① $\dfrac{(1+9)}{10} = 1$

② $\dfrac{(1-9)}{10} = -\dfrac{4}{5}$ or $\approx -.80$

$\boxed{\{-0.80, 1\}}$

4. $r^2 + 25 = 0$

a = 1
b = 0
c = 25

$0 = \dfrac{-(0) \pm \sqrt{(0)^2 - 4(1)(25)}}{2(1)}$

$0 = \dfrac{0 \pm \sqrt{\boxed{-100}}}{2} \rightarrow$ negative discriminant

$\boxed{\text{No Real Solutions}}$

must be in standard form (prox) →

5. $24x^2 - 14x = 6$

$\dfrac{-6 \; \bigg/ \; -6}{24x^2 - 14x - 6 = 0}$

a = 24
b = -14
c = -6

$= \dfrac{-(-14) \pm \sqrt{(-14)^2 - 4(24)(-6)}}{2(24)}$

$0 = \dfrac{14 \pm \sqrt{772}}{48}$

① $\dfrac{(14 + \sqrt{772})}{48} \approx 0.87$

② $\dfrac{(14 - \sqrt{772})}{48} \approx -0.29$

$\boxed{\{-0.29, 0.87\}}$