C11 - 4.4 - Quadratic Equation Notes

Solve

1   − 4   3 $a = 1$
$1x^2 - 4x + 3 = 0$ $b = -4$
                        $c = 3$

2   + 5   1 $a = 2$
$2x^2 + 5x + 1 = 0$ $b = -5$
                        $c = 1$

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

$\boxed{\text{Substitute With Brackets}}$

$x = \dfrac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(3)}}{2(1)}$

$x = \dfrac{+4 \pm \sqrt{4}}{2}$ ⬅ $\boxed{\begin{array}{l}(-4)^2 - 4(1)(3) = 4 \\ \text{Type underneath Square} \\ \text{Root into Calculator}\end{array}}$

$x = \dfrac{4 \pm 2}{2}$

$x = \dfrac{4 + 2}{2}$ $x = \dfrac{4 - 2}{2}$

$\boxed{x = 3}$ $x = 1$ $\boxed{\text{2 Rational Roots.}}$

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

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

$x = \dfrac{-5 \pm \sqrt{17}}{4}$

$x = \dfrac{-5 + \sqrt{17}}{4}$ $x = \dfrac{-5 - \sqrt{17}}{4}$ Exact Value

$x = -0.21$ $x = -2.28$ Decimal

$\boxed{\text{2 Irrational Roots.}}$ $\boxed{\begin{array}{l}b^2 - 4ac > 0 \\ \text{Discriminant} > 0 \\ \text{2 Real Roots.}\end{array}}$

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2   − 6   − 7 $a = 2$
$2x^2 - 6x - 7 = 0$ $b = -6$
                        $c = -7$

1   6   11 $a = 1$
$x^2 + 6x + 11 = 0$ $b = 6$
                        $c = 11$

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

$x = \dfrac{-(-6) \pm \sqrt{(-6)^2 - 4(2)(-7)}}{2(2)}$
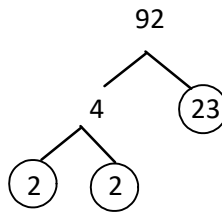
$x = \dfrac{6 \pm \sqrt{92}}{4}$

$x = \dfrac{6 \pm 2\sqrt{23}}{4}$

$x = \dfrac{3 \pm \sqrt{23}}{2}$

$\boxed{\begin{array}{l}\sqrt{92} = \sqrt{2 \times 2 \times 23} \\ \sqrt{92} = 2\sqrt{23}\end{array}}$

$\boxed{\text{Divide top and bottom by 2}\quad \dfrac{6}{2} = 3 \quad \dfrac{2}{2} = 1 \quad \dfrac{4}{2} = 2}$

92
 / \
4   23
/ \
2   2

$x = \dfrac{3 + \sqrt{23}}{2}$ $x = \dfrac{3 - \sqrt{23}}{2}$

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

$x = \dfrac{-(6) \pm \sqrt{(6)^2 - 4(1)(11)}}{2(1)}$

$x = \dfrac{-6 \pm \sqrt{-8}}{2}$ $\boxed{\text{Cant Square Root Negative}}$

$x = \dfrac{-6 \pm \sqrt{-8}}{2}$ ✗

$\boxed{\begin{array}{l}b^2 - 4ac < 0 \\ \text{Discriminant} < 0 \\ \text{No Real Roots.}\end{array}}$

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3   − 6   3 $a = 3$
$3x^2 - 6x + 3 = 0$ $b = -6$
                        $c = 3$

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

$x = \dfrac{-(-6) \pm \sqrt{(-6)^2 - 4(3)(3)}}{2(3)}$

$x = \dfrac{6 \pm \sqrt{0}}{6}$

$x = \dfrac{6 \pm 0}{6}$

$\boxed{x = 1}$ $\boxed{\begin{array}{l}b^2 - 4ac = 0 \\ \text{Discriminant} = 0 \\ \text{One Roots.}\end{array}}$

$\boxed{\begin{array}{l}3x^2 - 6x + 3 = 0 \\ \dfrac{3x^2}{3} - \dfrac{6x}{3} + \dfrac{3}{3} = \dfrac{0}{3} \\ x^2 - 2x + 1 = 0 \\ \\ 1 \quad -2 \quad 1 \\ \quad a = 1 \\ \quad b = -2 \\ \quad c = 1 \\ \\ \text{Simplify 1st!}\end{array}}$

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

$x = \dfrac{2 \pm \sqrt{0}}{2}$

$x = \dfrac{2 \pm 0}{2}$

$x = 1$