QUADRATIC EQUATION SOLVER

Group 5

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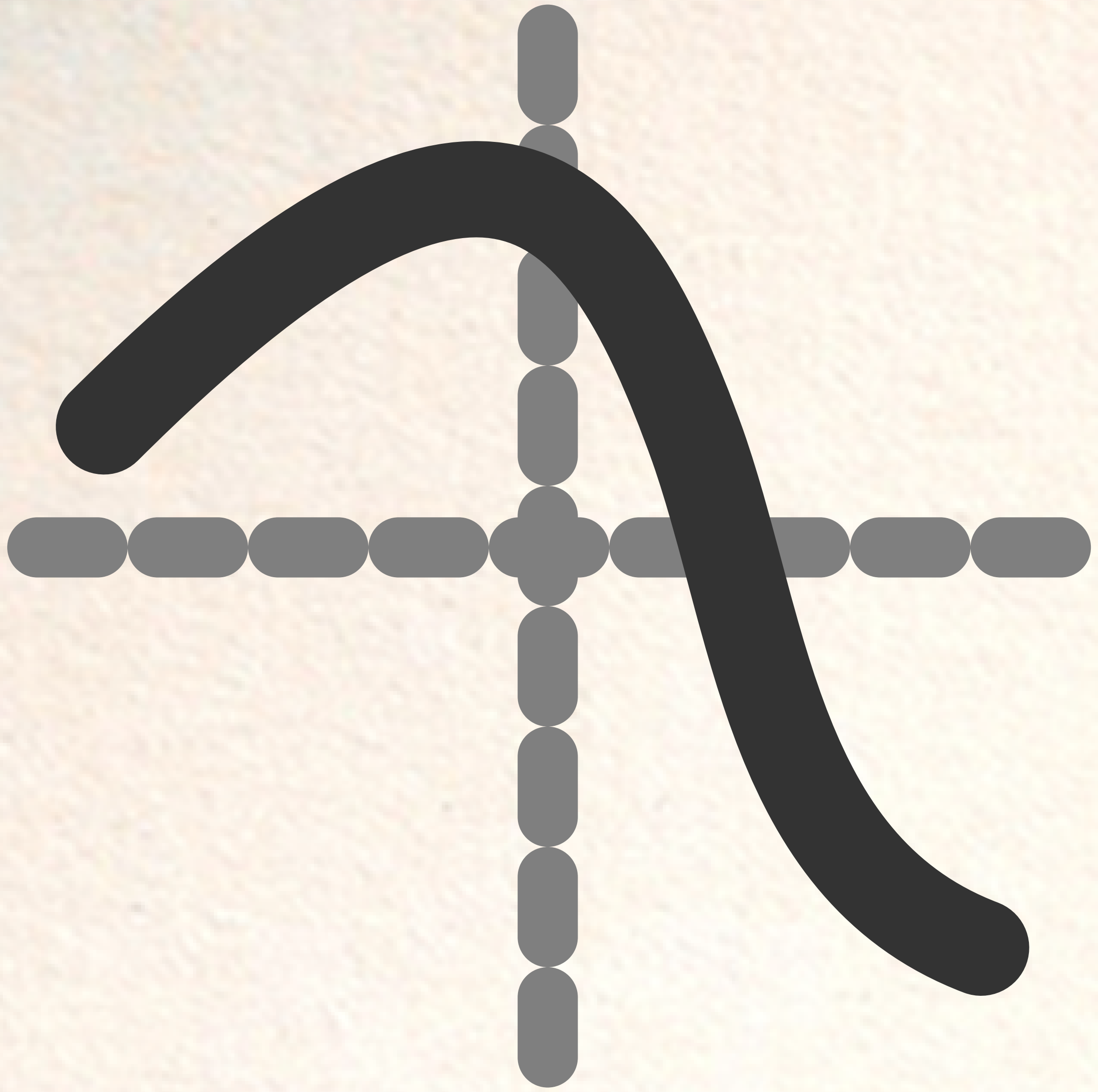


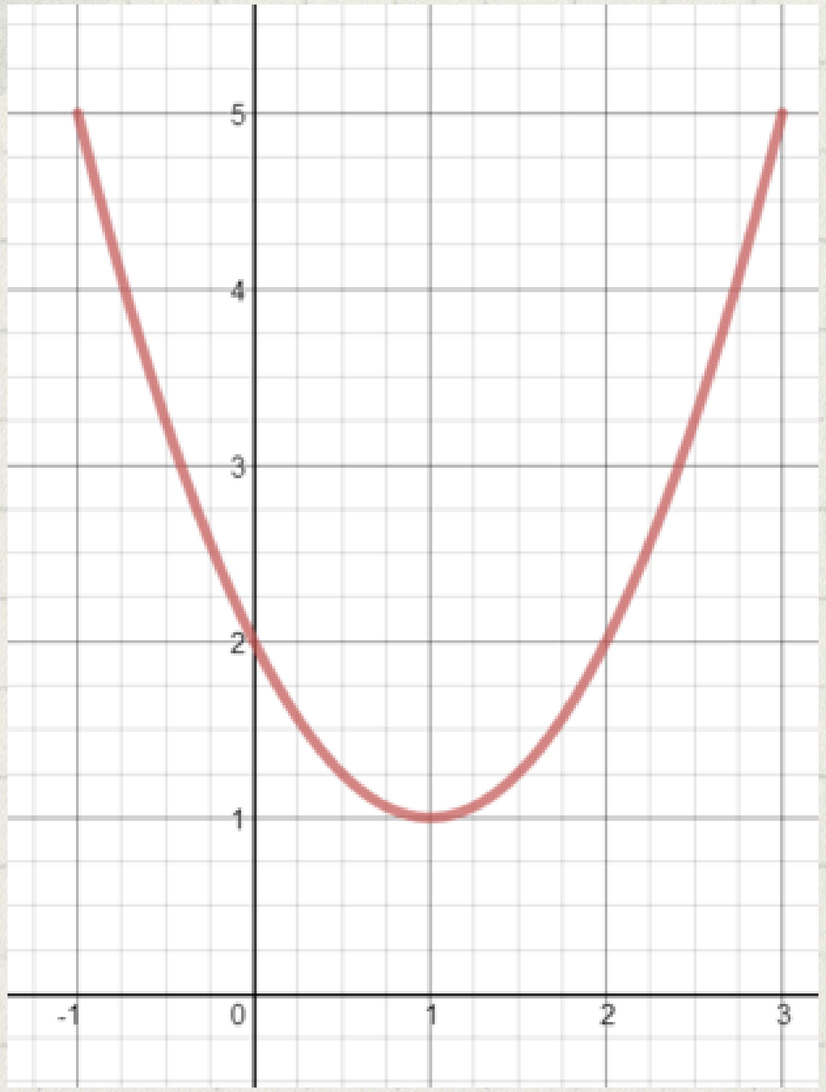
About Our model

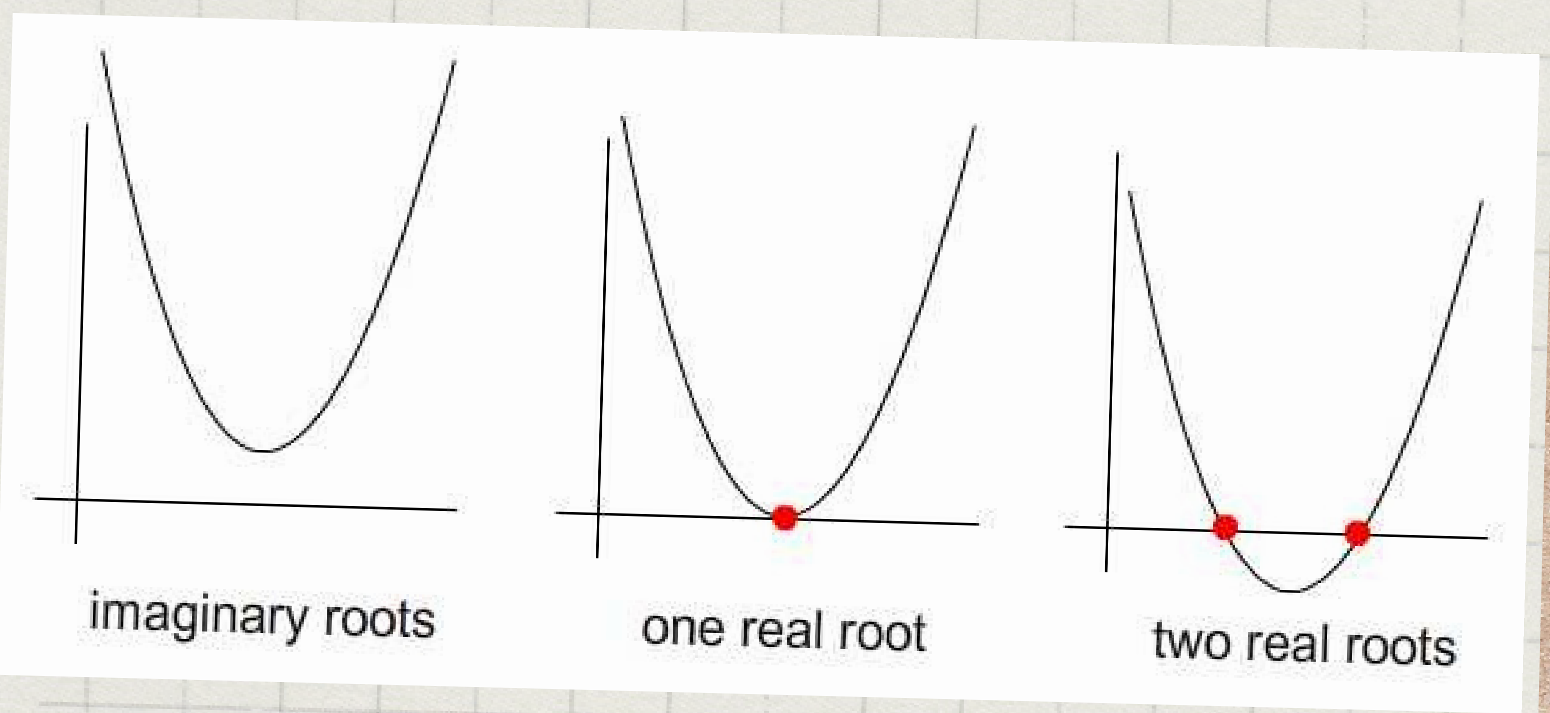
Our code is a very basic yet useful one. it helps you get the roots of a quadratic equation in seconds!
all you have to do is put in the values of 'a' 'b' and 'c' and run the code and you have your answer displayed... our code can also solve equations with complex and imaginary roots

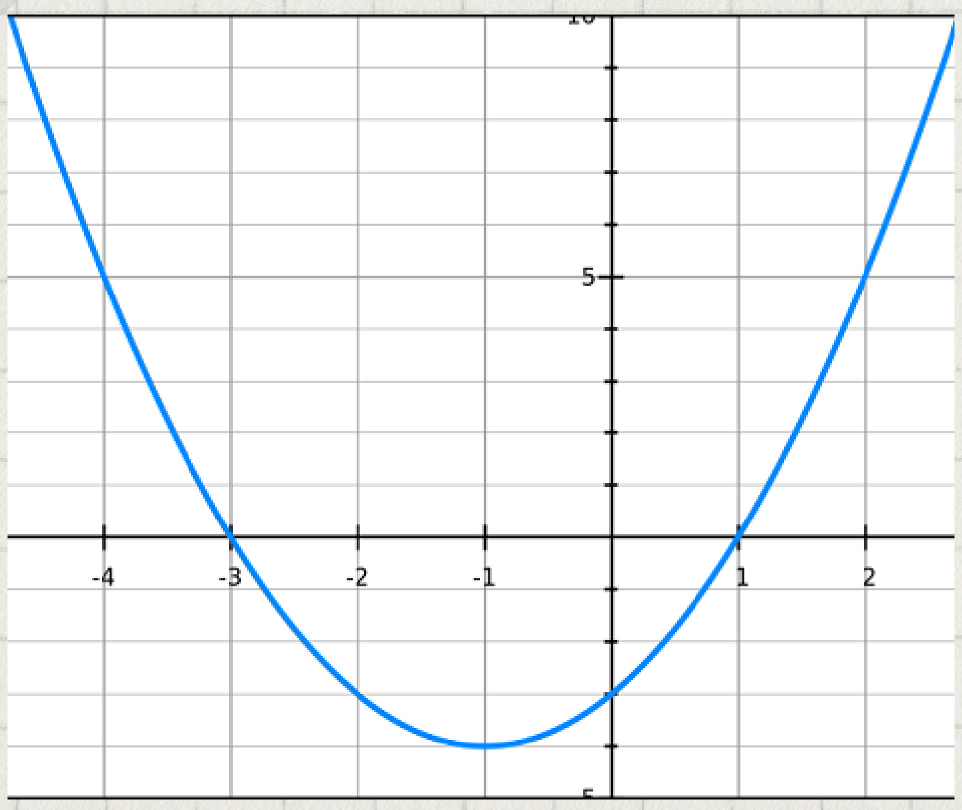
Quadratic equation solver

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

THE 2 PARABOLAS







THE DERIVATION

$ax^2 + bx + c = 0$	General Form of a quadratic equation
$x^2 + \frac{b}{a}x + \frac{c}{a} = 0$	Divide by a
$x^2 + \frac{b}{a}x = -\frac{c}{a}$	Subtract $\frac{c}{a}$ from both sides
$x^2 + \frac{b}{a}x + \left(\frac{b}{2a}\right)^2 = -\frac{c}{a} + \left(\frac{b}{2a}\right)^2$	Complete the square
$\left(x + \frac{b}{2a}\right)^2 = -\frac{c}{a} + \left(\frac{b}{2a}\right)^2$	Factor on left
$\left(x + \frac{b}{2a}\right)^2 = -\frac{c}{a} \cdot \frac{4a}{4a} + \left(\frac{b^2}{4a^2}\right)$	Find LCD on right
$\left(x + \frac{b}{2a}\right)^2 = \left(\frac{b^2 - 4ac}{4a^2}\right)$	Simplify
$\sqrt{\left(x + \frac{b}{2a}\right)^2} = \sqrt{\left(\frac{b^2 - 4ac}{4a^2}\right)}$	Take square root of both sides
$x + \frac{b}{2a} = \frac{\pm\sqrt{b^2 - 4ac}}{2a}$	Simplify
$x + \frac{b}{2a} - \frac{b}{2a} = \frac{\pm\sqrt{b^2 - 4ac}}{2a} - \frac{b}{2a}$	Subtract $-\frac{b}{2a}$ from both sides
$x = \frac{-b \pm\sqrt{b^2 - 4ac}}{2a}$	

THE IMAGINARY ROOTS

Quadratic Equation

$ax^2 + bx + c$

- Real Roots: D>0
- Imaginary Roots: D<0
  - Complex Roots
    - $\alpha = a + ib$
    - $\beta = a - ib$

$$ax^2 + bx + c = 0,\ a, b, c \in \mathrm{R}, a \neq 0$$

$$\alpha, \beta = \frac{-b \pm \sqrt{D}}{2a}, D = b^2 - 4ac$$

- $D < 0$: Imaginary roots $p + iq$, $p - iq$, $i = \sqrt{-1}$
- $D = 0$: $\alpha, \beta = \frac{-b}{2a}$. Rational and equal roots
- $D > 0$
  - D is perfect square: Rational, unequal roots
  - D is not perfect square: Irrational, conjugate pairs $p \pm \sqrt{q}$