

The Quadratic Formula

A quadratic equation is an equation of the form $ax^2 + bx + c = 0$, where $a \neq 0$. We can solve equations of this form by

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

identifying a , b and c and substituting them into the formula to find x .

Example: Solve $3x^2 + 5x - 8 = 0$

$$a = 3, b = 5, c = -8$$

$$\text{Then } x = \frac{-5 \pm \sqrt{(5)^2 - 4 * 3 * -8}}{2 * 3} = \frac{-5 \pm \sqrt{25 - -96}}{6} = \frac{-5 \pm \sqrt{121}}{6} = \frac{-5 \pm 11}{6} = \frac{-5 - 11}{6} = -\frac{8}{3} \text{ or } x = \frac{-5 + 11}{6} = 1$$

It is very important to get the correct values of a , b , and c . For the following equations the values are given

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

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

Notice that if a minus sign appears in the formula we have to solve then that value of a , b or c will be negative.

$$x = \frac{5 \pm \sqrt{((-5)^2 - 4 * -2 * -1)}}{2 * -2} = \frac{5 \pm \sqrt{(25 - 8)}}{-4} = \frac{5 \pm \sqrt{(17)}}{-4}$$

Then for the first equation

We may also solve quadratic equations by sketching a quadratic graph or by completing the square.

Example: Solve $x^2 - 3x - 6 = 0$

$$a = 1, b = -3, c = -6$$

$$\text{Then } x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4 * 1 * -6}}{2 * 1} = \frac{3 \pm \sqrt{9 - -24}}{2} = \frac{3 \pm \sqrt{33}}{2} = \frac{3 + 5.745}{2} = \frac{3 - 5.745}{2} = 4.372 \text{ or } -1.372.$$