

The Quadratic Formula

Let's use the completing the square technique to derive a general formula to solve:

$$ax^2 + bx + c = 0.$$

$$x^2 + \frac{b}{a}x + \frac{c}{a} = 0$$

$$x^2 + \frac{b}{a}x = -\frac{c}{a}$$

$$x^2 + \frac{b}{a}x + \left(\frac{b}{2a}\right)^2 = -\frac{c}{a} + \left(\frac{b}{2a}\right)^2$$

$$\left(x + \frac{b}{2a}\right)^2 = -\frac{c}{a} + \frac{b^2}{4a^2}$$

$$\left(x + \frac{b}{2a}\right)^2 = \frac{-4ac + b^2}{4a^2}$$

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

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

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

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad \leftarrow \text{The quadratic formula!}$$

Ex 1.

Solve using the quadratic formula: $2x^2 + 9x - 5 = 0$

Ex 2.

Solve using the quadratic formula: $2x^2 = 6x - 1$

Practice

1. Solve using the quadratic formula.

a) $x^2 = 2x + 1$

b) $4x^2 + 25 = 20x$

Q: What word can be written forward, backward or upside down, and can still be read from left to right?