

10.6 Solve Quadratic Equations by the Quadratic Formula



The Quadratic Formula

The solutions of the quadratic equation $ax^2 + bx + c = 0$ are

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \text{ where } a \neq 0 \text{ and } b^2 - 4ac \geq 0.$$

$$x^2 + 2x - 8 = 0$$

$a=1 \quad b=2 \quad c=-8$

$$\frac{-2 \pm \sqrt{2^2 - 4(1)(-8)}}{2(1)}$$

$$= \frac{-2 \pm \sqrt{4 + 32}}{2}$$

$$= \frac{-2 \pm \sqrt{36}}{2}$$

$$\frac{-2 \pm 6}{2}$$

$$\begin{aligned} & \rightarrow \frac{-2+6}{2} = \frac{4}{2} = 2 \\ & \rightarrow \frac{-2-6}{2} = \frac{-8}{2} = -4 \end{aligned}$$

$x=2 \quad x=-4$

Factorable

$$x^2 + 2x - 8 = 0$$

$$(x+4)(x-2) = 0$$

$$x+4=0 \quad x-2=0$$

$$x=-4 \quad x=2$$

as above

Quadratic formula
works for both

Not factorable

$$x^2 + 3x - 7 = 0$$

$$a=1 \quad b=3 \quad c=-7$$

$$\frac{-3 \pm \sqrt{3^2 - 4(1)(-7)}}{2(1)}$$

$$= \frac{-3 \pm \sqrt{9 + 28}}{2}$$

$$= \frac{-3 \pm \sqrt{37}}{2}$$

$$\sim \frac{-3+6.1}{2} \quad \rightarrow \quad \frac{-3-6.1}{2}$$

$$\sim \frac{3.1}{2} \quad \sim \frac{-9.1}{2}$$

$$\sim 1.55 \quad \sim -4.55$$

Use the quadratic formula to solve the equation. Round your solutions to the nearest hundredth, if necessary.

1. $x^2 - 8x + 16 = 0$

2. $3n^2 - 5n = -1$

Use Quadratic Formula to Solve

1) $x^2 + 6x - 10 = 0$

2) $x^2 - 4x = 9$

4) $-3x^2 + 7x = 2$

3) $2x^2 - 8x + 3 = 0$

FILM PRODUCTION For the period 1971–2001, the number y of films produced in the world can be modeled by the function $y = 10x^2 - 94x + 3900$ where x is the number of years since 1971. In what year were 4200 films produced?

$$4200 = 10x^2 - 94x + 3900$$

$$0 = 10x^2 - 94x - 300$$

$$a = 10 \quad b = -94 \quad c = -300$$

$$\frac{-(-94) \pm \sqrt{(-94)^2 - 4(10)(-300)}}{2(10)}$$

MULTI-STEP PROBLEM A football is punted from a height of 2.5 feet above the ground and with an initial vertical velocity of 45 feet per second.



- Use the vertical motion model to write an equation that gives the height h (in feet) of the football as a function of the time t (in seconds) after it has been punted.
- The football is caught 5.5 feet above the ground as shown in the diagram. Find the amount of time that the football is in the air.

