

Solving Quadratic Equations - Lesson 3

Solving Quadratic Equations
(The Quadratic Formula)

LI

- Use the Quadratic Formula to solve quadratic equations.

SC

- Use a calculator properly.

Different Types of Equations

Linear Equation - $ax + b = 0$

Quadratic Equation - $ax^2 + bx + c = 0$

Cubic Equation - $ax^3 + bx^2 + cx + d = 0$

etc ...

How to Solve any Linear Equation

$$a x + b = 0$$

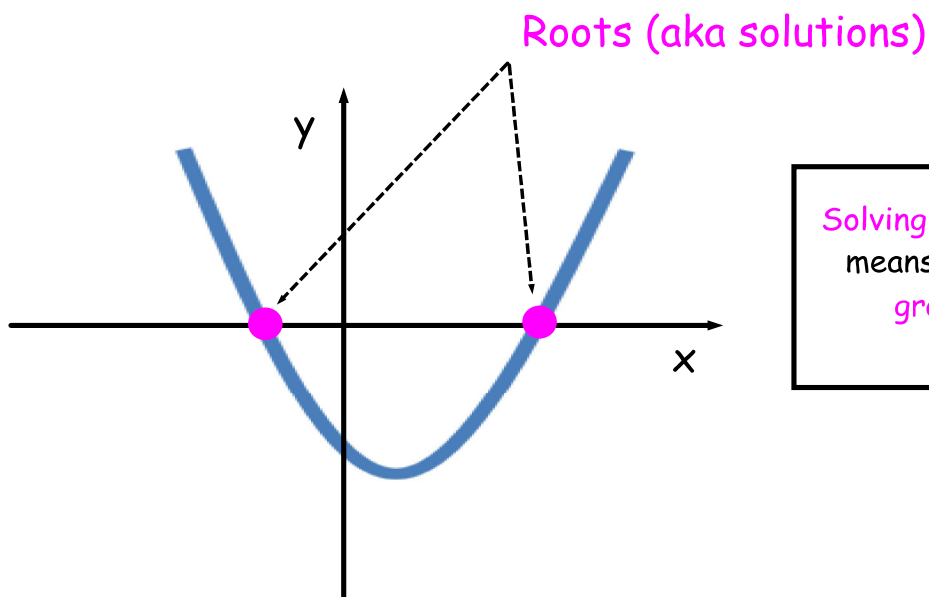
$$a x = - b$$

$$x = - \frac{b}{a}$$

('Linear Formula')

To **solve** a quadratic equation means
to find out which **x-values**
fit the equation

Graphical Interpretation



Solving a quadratic equation
means finding where the
graph crosses the
x-axis

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

Quadratic Formula

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

Example 1Solve $2x^2 - 5x - 1 = 0$ for x , correct to 1 d.p..

$$\begin{aligned} a &= 2, \\ b &= -5, \\ c &= -1 \end{aligned} \quad b^2 - 4ac = (-5)^2 - 4(2)(-1) = 33$$

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

$$x = \frac{-(-5) \pm \sqrt{33}}{4}$$

$$x = \frac{5 \pm \sqrt{33}}{4}$$

$$x = \frac{(5 + \sqrt{33})}{4}, \quad x = \frac{(5 - \sqrt{33})}{4}$$

$$x = 2.68 \dots, \quad x = -0.18 \dots$$

$$x = 2.7, -0.2 \text{ (1 d.p.)}$$

Example 2Solve $3x^2 + x - 6 = 0$ for x correct to 2 s.f..

$$\begin{array}{l} a = 3, \\ b = 1, \\ c = -6 \end{array} \quad b^2 - 4ac = 1^2 - 4(3)(-6) = 73$$

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

$$x = \frac{-1 \pm \sqrt{73}}{6}$$

$$x = \frac{(-1 + \sqrt{73})}{6}, \quad x = \frac{(-1 - \sqrt{73})}{6}$$

$$x = 1.25 \dots, \quad x = -1.59 \dots$$

$$x = 1.3, -1.6 \text{ (2 s.f.)}$$

Questions

1) Solve the following, giving your answer to 1 decimal place.

a $x^2 + 3x - 1 = 0$

b $2x^2 + 4x - 3 = 0$

c $3x^2 + 8x + 2 = 0$

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

e $x^2 + 4x + 1 = 0$

f $3x^2 - 10 = 0$

g $2x^2 + 3x - 1 = 0$

h $12 - 2x - 3x^2 = 0$

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

2) Solve the following, giving your answer to 2 significant figures.

a $3x^2 - 5x + 1 = 0$

b $x^2 - 8x + 7 = 0$

c $4x(x - 3) + 2 = 0$

d $(x + 5)^2 = 7$

e $(2x - 1)(x - 3) - 4 = 0$

f $x = \frac{3x + 2}{2x}$

g $x - 7 = \frac{3}{x}$

h $(x - 2)^2 + (x - 3)^2 = 18$

Answers

- 1) (a) $-3.3, 0.3$.
(b) $-2.6, 0.6$.
(c) $-2.4, -0.3$.
(d) $0.3, 6.7$.
(e) $-3.7, -0.3$.
(f) $-1.8, 1.8$.
(g) $-1.8, 0.3$.
(h) $-2.4, 1.7$.
(i) $-0.5, 1.2$.

- 2) (a) $0.23, 1.4$.
(b) $1, 7$.
(c) $0.18, 2.8$.
(d) $-7.6, -2.3$.
(e) $-0.14, 3.6$.
(f) $-0.5, 2$.
(g) $-0.41, 7.4$.
(h) $-0.46, 5.5$.