Year 1 Pure Chapter 2 - Quadratics

Solving Quadratics By Factoring

$$\mathbf{6x^2 + 13x - 5 = 0}$$

$ac = -30$

$b = 13$

15 and -2

$$6x^2 + 15x - 2x - 5 = 0$$

$$3x(2x + 5) - 1(2x + 5) = 0$$

$$(3x - 1)(2x + 5) = 0$$

$$\boldsymbol{x = \frac{1}{3}} \text{ or } \boldsymbol{x = -\frac{5}{2}}$$

Quadratic Formula

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

$$\mathbf{6x^2 + 13x - 5 = 0}$$

$a = 6\ b = 13\ c = -5$

$$\boldsymbol{x = \frac{1}{3}} \text{ or } \boldsymbol{x = -\frac{5}{2}}$$

Completing the Square

$$\boldsymbol{x^2 + bx = (x + \frac{b}{2})^2 - (\frac{b}{2})^2}$$

$$\mathbf{x^2 + 4x}$$

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

$$\mathbf{x^2 + 6x + 3}$$

$$= (x + 3)^2 - 9 + 3$$

$$= (x + 2)^2 - 6$$

$$\mathbf{2x^2 + 8x}$$

$$= 2(x^2 + 4)$$

$$= 2[(x^2 + 2) - 4]$$

$$= 2(x^2 + 2) - 8$$

$$\mathbf{2x^2 + 8x + 3}$$

$$= 2(x^2 + 4) + 3$$

$$= 2[(x^2 + 2) - 4] + 3$$

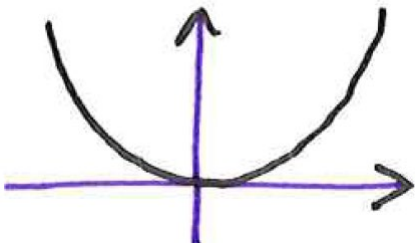
$$= [2(x^2 + 2) - 8] + 3$$

$$= 2(x^2 + 2) - 16 + 3$$

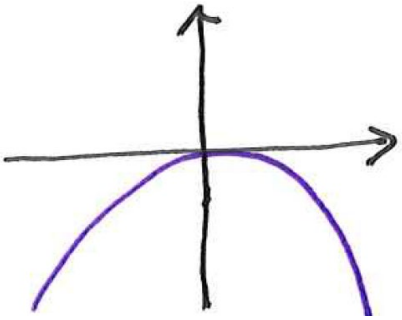
$$= 2(x^2 + 2) - 13$$

Quadratic Graphs

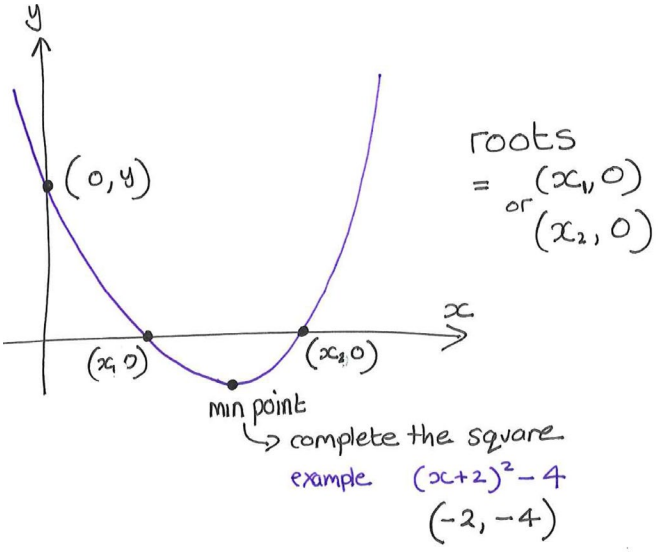
Positive Gradient



Negative Gradient



Roots and Turning Point



$$y = (x + a)^2 + b$$

Turning point

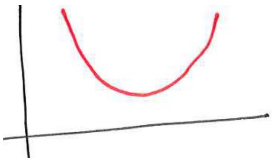
$$(-a, b)$$

Discriminant

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

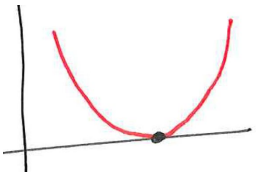
Discriminant $= b^2 - 4ac$

No roots



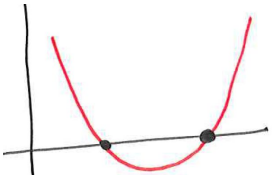
$b^2 - 4ac < 0$

One root



$b^2 - 4ac = 0$

Two roots



$b^2 - 4ac > 0$

Example

$x^2 + 4x + k = 0$

has two roots.

$$a = 1, b = 4, c = k$$

$$b^2 - 4ac > 0$$

$$4^2 - 4(1)(k) > 0$$

$$16 - 4k > 0$$

$$k < 4$$