MYP MATHEMATICS

QUADRATICS

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## *Quadratic expressions:*

*Any expression that is in the form of* $ax^2 + bx + c$

***Perfect square form:***

$$x^2 + 2kx + k^2 = (x + k)^2$$

**Examples :** $x^2 + 6x + 9 = (x + 3)^2$

***half it → square it***

$$x^2 - 6x + 9 = (x - 3)^2\ ,\quad x^2 - 10x + 25 = (x - 5)^2\ ,\quad x^2 + 8x + 16 = (x + 4)^2$$

***Completing to a square:***

$$(x^2 + 2kx) = (x + k)^2 - k^2$$

## *Quadratic equations:*

*Any equation that is in the form of* $ax^2 + bx + c = 0\ (where\ a \neq 0)$.

***Quadratic equations could be solved by:***

***factorisation, completing to a square or using the quadratic formula.***

***Quadratic formula***

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

***Discriminant:*** ***The number of solutions (roots) in a quadratic equation depends on the value of discriminant. If;***

$b^2 - 4ac < 0$ → ***there is no real solution.***

$b^2 - 4ac = 0$ → ***there is one real solution.*** ***(or could be phrased as having two equal roots.)***

$b^2 - 4ac > 0$ → ***there are two distinct real solutions.***

## *Factorisation of quadratics* $[ax^2 + bx + c]$

***Multiply a and c***

***Example :*** $2x^2 + 7x + 6 = 0$

$2 \times 6 = 12 \quad (4\ and\ 3)$

***Get two factors which have the sum equal to b***

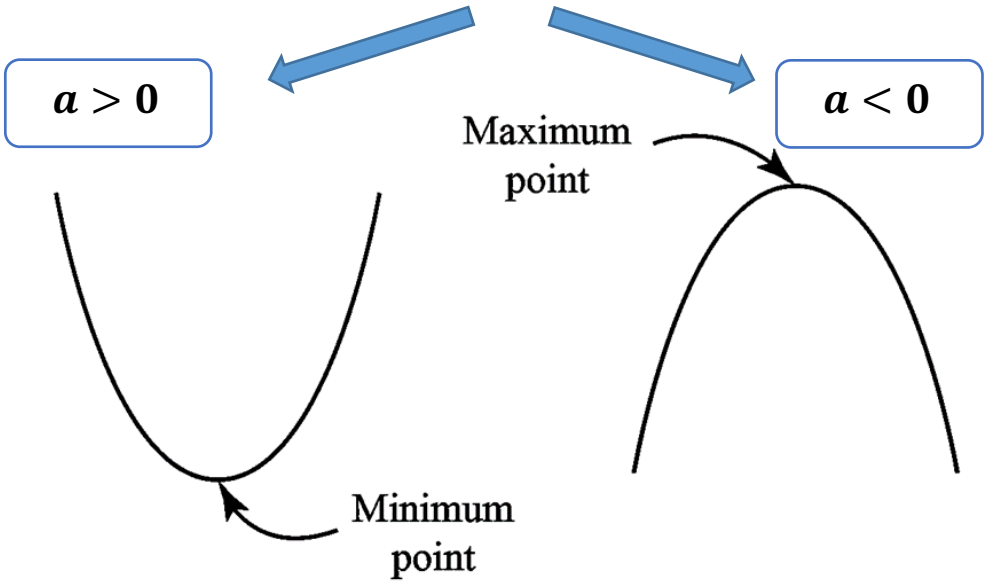
$2x^2 + 4x + 3x + 6 = 0 \rightarrow 2x(x + 2) + 3(x + 2) = 0$

$(x + 2)(2x + 3) = 0 \rightarrow x = -2\ \ or\ x = -3/2$

**Group 2 by 2 and take common factors out, then solve for *x*.**

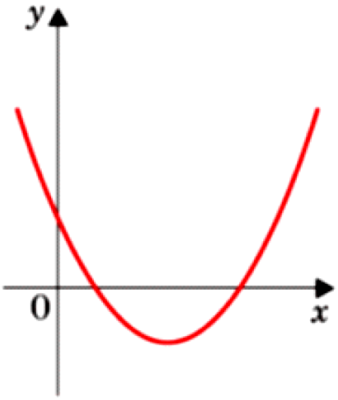
***Sketching quadratic curves:***

$$f(x) = ax^2 + bx + c$$



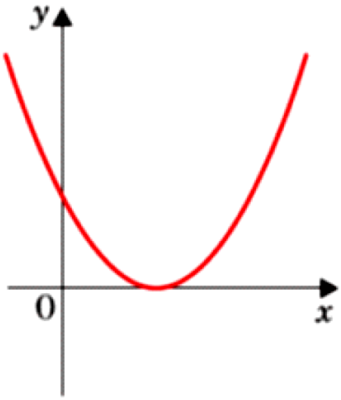

***Note: You need to clearly show x and y-intercepts. If the curve doesn't cut the x- axis you need to show the coordinates of the minimum/maximum point as well.***

$b^2 > 4ac$ and $a > 0$



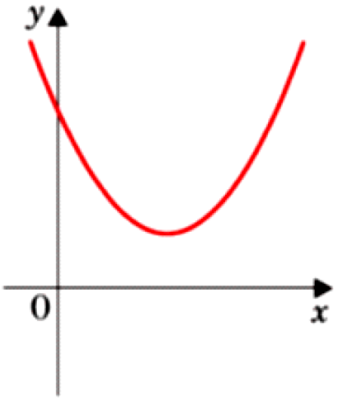

Here there are two different roots.

$b^2 = 4ac$ and $a > 0$



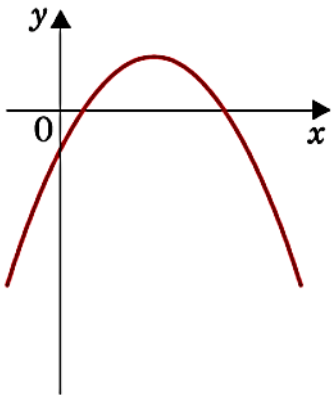

Here there are two equal roots.

$b^2 < 4ac$ and $a > 0$



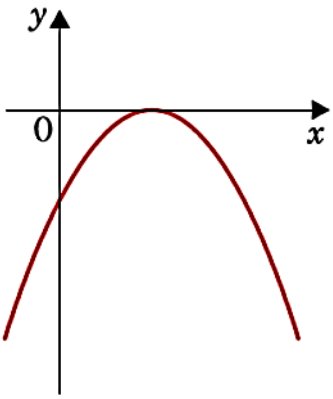

Here there are no real roots.

$b^2 > 4ac$ and $a < 0$



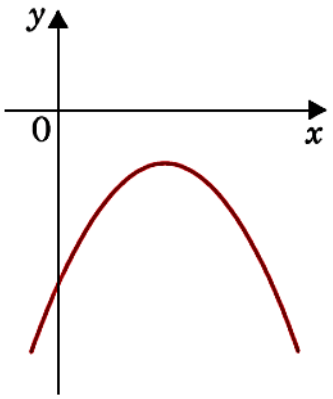

Here there are two different roots.

$b^2 = 4ac$ and $a < 0$




Here there are two equal roots.

$b^2 < 4ac$ and $a < 0$




Here there are no real roots.