O Level A Maths Tutorial 1: Quadratic Functions

Syllabus :

• Finding the maximum or minimum value of a quadratic function using the method of completing the square

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1. (i) Expand this quadratic function: $y = (x+2)^2 + 5$.

(ii) Complete the squares for this quadratic function: $y = x^2 + 4x + 5$.

(iii) State whether it has a maximum or minimum, and find the y value.

(iv) Sketch the graph and label the above features.

2. Complete the squares for this expression :

$$y = -2x + 4x + 1$$

Find its maximum.

• Conditions for $y = ax^2 + bx + c$ to be always positive (or always negative)

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3. (i) Complete the squares for $y = ax^2 + b + c$.

(ii) Hence derive the solution for $ax^2 + b + c = 0$. Show that

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

(iii) State and explain the condition for y to be always positive. State the condition for y to be always negative.

• Using quadratic functions as models

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4. A ball is dropped from a height of s of 2 m. It falls with an acceleration g of 10 m/s^2. s and g are related by

$$s = ut + \tfrac{1}{2} gt^2$$

where u is the initial downward velocity of 0.5 m/s.

Find the time t that the ball takes to hit the ground.

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