

GRADE 9 | 2024

Functions and Graphs

Mathematics

CAPS ALIGNED

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1. Linear Functions ($y = mx + c$)

FORMULA: Gradient $m = (y_2 - y_1)/(x_2 - x_1)$

y-intercept c: set $x = 0$

x-intercept: set $y = 0$

The gradient tells you the slope. Positive gradient slopes up; negative gradient slopes down.

2. Parabola ($y = ax^2 + q$)

- If $a > 0$: parabola opens upward, minimum turning point
- If $a < 0$: parabola opens downward, maximum turning point
- Turning point is at $(0, q)$
- Axis of symmetry: $x = 0$ (the y-axis)

FORMULA: y-intercept: set $x=0$, $y = q$

x-intercepts: set $y=0$, $ax^2 = -q$, $x = \pm\sqrt{-q/a}$

3. Hyperbola ($y = a/x$)

The hyperbola has two arms. The x-axis and y-axis are asymptotes (lines the curve approaches but never touches).

- If $a > 0$: arms in 1st and 3rd quadrants
- If $a < 0$: arms in 2nd and 4th quadrants

4. Exponential Function ($y = ab^x$)

If $b > 1$, the function grows exponentially. If $0 < b < 1$, it decays.

FORMULA: $y = 2^x$: for $x = 0$, $y = 1$; $x = 1$, $y = 2$; $x = 2$, $y = 4$; $x = -1$, $y = 0.5$

5. Reading Graphs

From a graph, you can read: x-intercepts, y-intercepts, turning points, maximum and minimum values, intervals where the function is positive or negative.