

Sequences, functions and graphs – Key topics for a C/B grade

Sequences

Use term-to-term and position-to-term rules to generate sequences

Find the 6th term of the sequence with rule $n^2 - 3n + 5$

$$6^2 - (3 \times 6) + 5 = 29$$

To find the nth term rule for a sequence, look at what it goes up in, and then work out the previous term

E.g. 6, 8, 10, 12, 14 goes up in 2s, so $2n$. The previous term would be 4, so the rule is $2n+4$.

Functions

Substitute in to find the value of a function

$$f(x) = 4x + 7$$

$$f(5) = 4 \times 5 + 7 = 27$$

Composite functions are done from the inside out

$$f(x) = 4x + 7, g(x) = x^2$$

Find $f(g(3))$

$$g(3) = 3^2 = 9$$

$$f(9) = 4 \times 9 + 7 = 43$$

Graphs

To draw a graph you need a table of values. Remember that you can use mode 3 of your calculator to do this for you. (Mode 1 takes the calculator back to normal.)

If the graph is a straight line, join the points with a ruler. Otherwise use a *smooth* curve (draw it with a dark pencil, that can be rubbed out if necessary). The graph should be a single line.

The gradient of a graph tells you how steep it is. For a straight line, find 2 points on the line and work out (distance up)÷(distance across). Remember if the line slopes down it has a negative gradient.

The equation of a straight line is $y = mx + c$ where m is the gradient and c is the intercept.

E.g. the line with gradient 4 and intercept -2 has the equation $y = 4x - 2$

[To find the gradient of a curve, draw a tangent and find its gradient.]

Calculus

To differentiate a power of an integer use the formula $y = x^n$, $\frac{dy}{dx} = nx^{n-1}$

E.g. $y = 5x^4 + 3x^2 - 4x + 2$

$$\frac{dy}{dx} = 5(4x^3) + 3(2x) - 4(1) + 2 = 20x^3 + 6x - 4$$

At a turning point, $\frac{dy}{dx} = 0$