You can use a simple rule to differentiate functions in the form ax^n

Key point

If $f(x) = ax^n$ then $f'(x) = nax^{n-1}$

If a function is a sum of two other functions, you can differentiate each function one at a time and then add the results.

Key point

If $h(x) = f(x) + g(x)$ then $h'(x) = f'(x) + g'(x)$

Isaac Newton is credited with having come up with the idea of Calculus first, but **Gottfried Leibniz**, a German mathematician and contemporary of Newton, also developed the concept and devised an alternative notation which is commonly used.

See p.300 For a list of mathematical notation.

For $y_Q - y_P$ he used the symbol δy and for $x_Q - x_P$ he used the symbol δx

So $\frac{y_Q - y_P}{x_Q - x_P} = \frac{\delta y}{\delta x}$ and he wrote that $\lim_{\delta x \to 0} \frac{\delta y}{\delta x} = \frac{dy}{dx}$

Key point

If $y = f(x)$ then $\frac{dy}{dx} = f'(x)$

Differentiating a function, or finding $\frac{dy}{dx}$, gives a formula for the gradient of the graph of the function at a point. This is also the gradient of the tangent to the curve at this point.

Try it on your calculator

You can use a calculator to evaluate the gradient of the tangent to a curve at a given point.

$$\frac{d}{dx}(5X^2 - 2X)\Big|_{x=3}$$

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Activity

Find out how to calculate the gradient of the tangent to the curve $y = 5x^2 - 2x$ where $x = 3$ on *your* calculator.