

# 1 | antiderivative

## 1.1 | intuition

An antiderivative is the opposite of a derivative—given a slope, find a function with that slope

## 1.2 | example

$$\int (2x) dx = x^2 + c$$

Where  $c$  is the 'integration constant' that we don't know. This exists because when taking the derivative, we lose the constant term, so when taking the integral, we should get it back.

The function that is being integrated is called the *integrand*.

Similarly,

$$\frac{d}{dx} \ln x = \frac{1}{x} \Rightarrow \int \ln x dx = \ln x$$

## 1.3 | uses

### 1.3.1 | more taylor series polynomials!

$$\begin{aligned} \frac{d}{dx} \ln(1+x) &= \frac{1}{1+x} = 1 - x + x^2 - x^3 + \dots \\ \ln(1+x) &= \int \frac{d}{dx} \ln(1+x) dx = \\ &= \int (1 - x + x^2 - x^3 + \dots) dx \\ &= \int 1 dx - \int x dx + \int x^2 dx - \int x^3 dx \dots \\ &= x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} \dots \end{aligned}$$

# 2 | integration rules

$$2.1 \mid \int (f(x) + g(x)) dx = \int f(x) dx + \int g(x) dx$$