

Limits and Integrals

Limit Definition of the Derivative

Let $f(x) = x^2$. Then:

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \rightarrow 0} \frac{(x+h)^2 - x^2}{h}$$

Definite Integral

The area under $f(x) = x$ from 0 to 1 is:

$$\int_0^1 x \, dx = \left[\frac{x^2}{2} \right]_0^1 = \frac{1}{2}$$