Carleton UNIVERSITY
Canada's Capital University

Mathematics Tutorial Series
Integral Calculus #8

Simple Anti-Derivatives

The indefinite integral

$$\int f(x)\,dx$$

stands for the general anti-derivative of $f(x)$.

So for some function $F(x)$ we have

$$\int f(x)\,dx = F(x) + C$$

This means that $F' = f$ and the constant C is included to show that we can add any constant to $F(x)$ and still have the same derivative $f(x)$.

The **overall strategy** for integration is to reduce the integral to simpler integrals until we reach one we recognize.

Simple anti-derivatives

$$\int x^m\,dx = \frac{1}{m+1}x^{m+1} + C$$

$$\int \frac{1}{x}dx = \log x + C$$

$$\int \frac{1}{x+a}dx = \log(x+a) + C$$

Examples

$$\int x^4 + 5x^3 - 3x^2 + x + 7\,dx$$

$$\int x + \frac{1}{x} dx$$

$$\int \frac{x^2 + 1}{x} dx$$

Solutions

$$\int x^4 + 5x^3 - 3x^2 + x + 7\,dx$$

$$= \frac{1}{5}x^5 + \frac{5}{4}x^4 - \frac{3}{3}x^3 + \frac{1}{2}x^2 + 7x + C$$

$$\int x + \frac{1}{x} dx = \frac{1}{2}x^2 + \log x + C$$

$$\int \frac{x^2 + 1}{x} dx = \int x + \frac{1}{x} dx$$