

# Integrals

## Basic antiderivatives

### Powers

$$\int a \, dx = ax + C$$

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

### Exponentials

$$\int e^x \, dx = e^x + C.$$

$$a^x \, dx = \frac{a^x}{\ln(a)} + C$$

### Logarithms

$$\int \frac{1}{x} \, dx = \ln |x| + C$$

### Trigonometrics

$$\int \sin(x) \, dx = -\cos(x) + C$$

$$\int \cos(x) \, dx = \sin(x) + C$$

$$\int \frac{1}{\cos(x)^2} \, dx = \tan(x) + C$$

$$\int \tan(x) \, dx = \ln |\sec(x)| + C$$

$$\int \sec(x) \, dx = \ln |\sec(x) + \tan(x)| + C$$

$$\int \csc(x) \, dx = \ln |\csc(x) - \cot(x)| + C$$

$$\int \cot(x) \, dx = \ln |\sin(x)| + C$$

$$\int \sec(x)^2 \, dx = \tan(x) + C$$

$$\int \csc(x)^2 \, dx = -\cot(x) + C$$

$$\int \sec(x) \tan(x) \, dx = \sec(x) + C$$

$$\int \csc(x) \cot(x) \, dx = -\csc(x) + C$$

### Rationals e irracionales

$$\int \frac{dx}{\sqrt{a^2 - x^2}} = \sin^{-1} \left( \frac{x}{a} \right) + C$$

$$\int \frac{dx}{a^2 + x^2} = \frac{1}{a} \tan^{-1} \left( \frac{x}{a} \right) + C$$

$$\int \frac{dx}{x\sqrt{x^2 - a^2}} = \frac{1}{a} \sec^{-1} \left( \frac{x}{a} \right) + C$$

$$\int \frac{dx}{a^2 - x^2} = \frac{1}{2a} \ln \left| \frac{x+a}{x-a} \right| + C$$

## Integration rules

### Sum

$$\int u + v \, dx = \int u \, dx + \int v \, dx$$

### Difference

$$\int u - v \, dx = \int u \, dx - \int v \, dx$$

### Product by a constant

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

### Parts

$$\int u \, dv = uv - \int v \, du$$

### Substitution

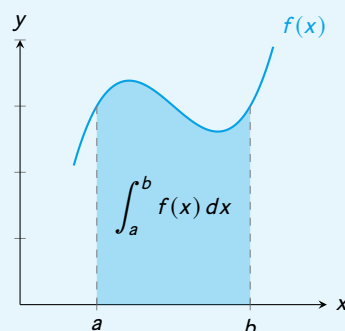
$$\int f(u) u' \, dx = \int f(u) \, du$$

## Definite integrals

### Barrow's rule

$$\int_a^b f(x) \, dx = F(b) - F(a)$$

where  $F(x) = \int f(x) \, dx$



### Properties

$$\int_a^a f(x) \, dx = 0$$

$$\int_a^b f(x) \, dx = - \int_b^a f(x) \, dx$$

$$\int_a^b f(x) \, dx = \int_a^c f(x) \, dx + \int_c^b f(x) \, dx$$

where  $a < c < b$ .