**The definite integral**, by definition, is given as limit of a sum:

$$\int_a^b f(x)\,dx = \lim_{n\to\infty} \sum_{i=1}^{n} f(x_i)\Delta x_i \ .$$

A sum of this form is called a Riemann sum.

**The Indefinite Integral**, of a function $f$, is defined to be the antiderivatives of $f$:

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

**Properties of integral**:

$$\int x^n\,dx = \frac{x^{n+1}}{n+1}\ , \quad n \neq -1 \ .$$

$$\int k\,f(x)\,dx = k \int f(x)\,dx \ .$$

$$\int \Big(f(x) + g(x)\Big)\,dx = \int f(x)\,dx + \int g(x)\,dx \ .$$

**General power formula**:

$$\int [f(x)]^n\,f'(x)\,dx = \frac{[f(x)]^{n+1}}{n+1}\ , \quad n \neq -1 \ .$$

**Example 1**. Evaluate the integral $\int (x^2+1)^{-1/2}\,2x\,dx$ .

**Example 2**. Integrate $\int x^2 \sqrt{x^3 + 1}\, dx$ .

**Example 3**. Integrate $\int \frac{x\,dx}{\sqrt[3]{1-x^3}}$ .

**Example 4**. Integrate $\int (x^2-1)^2\,dx$ .

**Example 5**. $\displaystyle\int_{-\sqrt{6}}^{-1} \frac{x\,dx}{\sqrt{10-x^2}}$ .