- $\int 0\ dx = C$
- $\int 1\ dx = x + C$
- $\int k\ dx = kx + C$
- $\int x^n\ dx = \dfrac{x^{n+1}}{n+1} + C, \text{for } n \neq 1$
- $\int x^{-1}\ dx = \ln|x| + C$
- $\int a^x\ dx = \dfrac{a^x}{\boxed{\ln a}} + C$

  Special case $\int e^x\ dx = e^x + C$
- $\int \sin x\ dx = -\cos x + C$
- $\int \cos x\ dx = \sin x + C$
- $\int \sec^2 x\ dx = \tan x + C$
- $\int \sec x \tan x\ dx = \sec x + C$
- $\int \csc^2 x\ dx = -\cot x + C$
- $\int \csc x \cot x\ dx = -\csc x + C$
- $\int \dfrac{1}{1+x^2} = \tan^{-1} x + C$
- $\int \dfrac{1}{\sqrt{1-x^2}} = \sin^{-1} x + C$
- $\int \dfrac{1}{|x|\sqrt{x^2-1}} = \sec^{-1} x + C$
- $\int (ax+b)^n\ dx = \dfrac{(ax+b)^{n+1}}{a(n+1)} + C, \text{for } n \neq 1$
- $\int (ax+b)^{-1}\ dx = \dfrac{\ln|ax+b|}{a} + C$
- $\int a^{mx+b}\ dx = \dfrac{a^{mx+b}}{\boxed{m \ln a}} + C$

  Special case $\int e^{ax+b}\ dx = \dfrac{e^{ax+b}}{a} + C$
- $\int \sin(ax+b)\ dx = -\dfrac{\cos(ax+b)}{a} + C$
- $\int \cos(ax+b)\ dx = \dfrac{\sin(ax+b)}{a} + C$
- $\int \sec^2(ax+b)\ dx = \dfrac{\tan(ax+b)}{a} + C$
- $\int \sec(ax+b)\tan(ax+b)\ dx = \dfrac{\sec(ax+b)}{a} + C$
- $\int \csc^2(ax+b)\ dx = -\dfrac{\cot(ax+b)}{a} + C$
- $\int \csc(ax+b)\cot(ax+b)\ dx = -\dfrac{\csc(ax+b)}{a} + C$
- $\int \dfrac{1}{1+(ax+b)^2} = \dfrac{\tan^{-1}(ax+b)}{a} + C$
- $\int \dfrac{1}{\sqrt{1-(ax+b)^2}} = \dfrac{\sin^{-1}(ax+b)}{a} + C$
- $\int \dfrac{1}{|ax+b|\sqrt{(ax+b)^2-1}} = \dfrac{\sec^{-1}(ax+b)}{a} + C$

**Integration Rules:**

- $\int (f(x) \pm g(x))\ dx = \int f(x)\ dx \pm \int g(x)\ dx$
- $\int kf(x)\ dx = k \int f(x)\ dx$ where $k$ is a constant

**Definite Integral:**

- $\int_a^b f(x)\ dx = F(b) - F(a)$
- $\dfrac{d}{dx} \int_a^b f(x)\ dx = 0$

**Properties of Definite Integral:**

- $\int_a^a f(x)\ dx = 0$
- $\int_a^b f(x)\ dx = -\int_b^a f(x)\ dx$
- $\int_a^b (f(x) \pm g(x))\ dx = \int_a^b f(x)\ dx \pm \int_a^b g(x)\ dx$
- $\int_a^b kf(x)\ dx = k\int_a^b f(x)\ dx$ where $k$ is a constant
- $\int_a^b k\ dx = k(b-a)$ where $k$ is a constant
- $\int_a^b f(x)\ dx = \int_a^c f(x)\ dx + \int_c^b f(x)\ dx$
- If $f(x) \geq 0\ \forall x \in [a,b]$, then $\int_a^b f(x)\ dx \geq 0$
- If $f(x) \geq g(x)\ \forall x \in [a,b]$, then $\int_a^b f(x)\ dx \geq \int_a^b g(x)\ dx$

**The Fundamental Theorem of Calculus:**

- $\frac{d}{dx}\int_a^x f(t)\ dt = f(x)$
- $\frac{d}{dx}\int_x^b f(t)\ dt = -f(x)$
- $\frac{d}{dx}\int_{g_1(x)}^{g_2(x)} f(t)\ dt = f(g_2(x))g_2'(x) - f(g_1(x))g_1'(x)$