

# Rules of Integration:

$$1. \int 1 dx = x + C$$

$$2. \int a dx = ax + C$$

$$3. \int x^n dx = \frac{x^{n+1}}{n+1} + C, n \neq -1$$

$$4. \int \sin x dx = -\cos x + C$$

$$5. \int \cos x dx = \sin x + C$$

$$6. \int \sec^2 x dx = \tan x + C$$

$$7. \int \csc^2 x dx = -\cot x + C$$

$$8. \int \sec x(\tan x) dx = \sec x + C$$

$$9. \int \csc x(\cot x) dx = -\csc x + C$$

$$10. \int \frac{1}{x} dx = \ln |x| + C$$

$$11. \int e^x dx = e^x + C$$

$$12. \int a^x dx = \frac{a^x}{\ln a} + C, a > 0, a \neq 1$$

$$13. \int \frac{1}{\sqrt{1-x^2}} dx = \sin^{-1} x + C$$

$$14. \int \frac{1}{1+x^2} dx = \tan^{-1} x + C$$

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

Factor in denominator	Term in partial fraction decomposition
$ax + b$	$\frac{A}{ax + b}$
$(ax + b)^k$	$\frac{A_1}{ax + b} + \frac{A_2}{(ax + b)^2} + \cdots + \frac{A_k}{(ax + b)^k}, \quad k = 1, 2, 3, \dots$
$ax^2 + bx + c$	$\frac{Ax + B}{ax^2 + bx + c}$
$(ax^2 + bx + c)^k$	$\frac{A_1x + B_1}{ax^2 + bx + c} + \frac{A_2x + B_2}{(ax^2 + bx + c)^2} + \cdots + \frac{A_kx + B_k}{(ax^2 + bx + c)^k}, \quad k = 1, 2, 3, \dots$