

적분공식

1. 다항함수, 유리함수

- $\int k \, dx = kx + C$
- $\int x^n \, dx = \frac{x^{n+1}}{n+1} + C \quad (\text{for } n \neq -1)$
- $\int (ax+b)^n \, dx = \frac{(ax+b)^{n+1}}{a(n+1)} + C \quad (\text{for } n \neq -1)$
- $\int \frac{1}{x} \, dx = \ln|x| + C$
- $\int \frac{c}{ax+b} \, dx = \frac{c}{a} \ln|ax+b| + C$
- $\int \frac{1}{1+x^2} \, dx = \arctan x + C$

2. 지수함수

- $\int e^x \, dx = e^x + C$
- $\int a^x \, dx = \frac{a^x}{\ln a} + C$

3. 로그함수

- $\int \ln x \, dx = x \ln x - x + C$
- $\int \log_a x \, dx = x \log_a x - \frac{x}{\ln a} + C$

4. 삼각함수

- $\int \sin x \, dx = -\cos x + C$
- $\int \cos x \, dx = \sin x + C$
- $\int \tan x \, dx = -\ln |\cos x| + C = \ln |\sec x| + C$
- $\int \sec x \, dx = \ln |\sec x + \tan x| + C$
- $\int \csc x \, dx = \ln |\csc x - \cot x| + C$
- $\int \cot x \, dx = \ln |\sin x| + C$
- $\int \sec^2 x \, dx = \tan x + C$
- $\int \csc^2 x \, dx = -\cot x + C$
- $\int \sec x \tan x \, dx = \sec x + C$
- $\int \csc x \cot x \, dx = -\csc x + C$
- $\int \sin^2 x \, dx = \frac{1}{2} \left(x - \frac{\sin 2x}{2} \right) + C = \frac{1}{2} (x - \sin x \cos x) + C$
- $\int \cos^2 x \, dx = \frac{1}{2} \left(x + \frac{\sin 2x}{2} \right) + C = \frac{1}{2} (x + \sin x \cos x) + C$
- $\int \sec^3 x \, dx = \frac{1}{2} \sec x \tan x + \frac{1}{2} \ln |\sec x + \tan x| + C$

5. 역삼각함수

- $\int \sin^{-1} x \, dx = x \sin^{-1} x + \sqrt{1 - x^2} + C, \quad \text{for } |x| \leq 1$
- $\int \cos^{-1} x \, dx = x \cos^{-1} x - \sqrt{1 - x^2} + C, \quad \text{for } |x| \leq 1$
- $\int \tan^{-1} x \, dx = x \tan^{-1} x - \frac{1}{2} \ln |1 + x^2| + C, \quad \text{for all real } x$
- $\int \sec^{-1} x \, dx = x \sec^{-1} x - \ln |x (1 + \sqrt{1 - x^{-2}})| + C, \quad \text{for } |x| \geq 1$
- $\int \csc^{-1} x \, dx = x \csc^{-1} x + \ln |x (1 + \sqrt{1 - x^{-2}})| + C, \quad \text{for } |x| \geq 1$
- $\int \cot^{-1} x \, dx = x \cot^{-1} x + \frac{1}{2} \ln |1 + x^2| + C, \quad \text{for all real } x$

테일러 급수 정리

$$\frac{1}{1-x} = 1 + x + x^2 + \dots + x^n + \dots = \sum_{k=0}^{\infty} x^k \quad (|x| < 1)$$

$$\frac{1}{1-x} = 1 - x + x^2 - \dots + (-x)^n + \dots = \sum_{k=0}^{\infty} (-1)^k x^k \quad (|x| < 1)$$

$$e^x = 1 + x + \frac{x^2}{2!} + \dots + \frac{x^n}{n!} + \dots = \sum_{k=0}^{\infty} \frac{x^k}{k!} \quad (|x| < \infty)$$

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \dots + (-1)^n \frac{x^{2n+1}}{(2n+1)!} + \dots = \sum_{k=0}^{\infty} (-1)^k \frac{x^{2k+1}}{(2k+1)!} \quad (|x| < \infty)$$

$$\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \dots + (-1)^n \frac{x^{2n}}{(2n)!} + \dots = \sum_{k=0}^{\infty} (-1)^k \frac{x^{2k}}{(2k)!} \quad (|x| < \infty)$$

$$\ln(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \dots + (-1)^{n-1} \frac{x^n}{n} + \dots = \sum_{k=1}^{\infty} (-1)^{k-1} \frac{x^k}{k} \quad (-1 < x \leq 1)$$

$$\arctan x = x - \frac{x^3}{3} + \frac{x^5}{5} - \dots + (-1)^n \frac{x^{2n+1}}{2n+1} + \dots = \sum_{k=1}^{\infty} (-1)^k \frac{x^{2k+1}}{2k+1} \quad (|x| \leq 1)$$