

# Section 28.1: The General Power Formula

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10:51 AM

general  
power  
formula

$$\int u^n du = \frac{u^{n+1}}{n+1} + C$$

for  $n \neq -1$



now,  $u$  can be anything

examples: Integrate

①  $\int \sin^4 x \cos x dx$  <sup>du</sup>

let  $u = \sin x$   
 $du = \cos x dx$

$$\begin{aligned} &= \int u^4 du \\ &= \frac{u^5}{5} + C \\ &= \frac{\sin^5 x}{5} + C \end{aligned}$$

②  $\int \frac{(\ln x)^3}{x} dx$

let  $u = \ln x$   
 $du = \frac{1}{x} dx$

$$\begin{aligned} &= \int u^3 du \\ &= \frac{u^4}{4} + C \\ &= \frac{(\ln x)^4}{4} + C \end{aligned}$$

$$\left[ = \frac{\ln^4 x}{4} + C \right]$$

$$(3) \int \sec^5 \theta \tan \theta \, d\theta$$

$$\text{let } u = \sec \theta \\ du = \sec \theta \tan \theta \, d\theta$$

$$= \int \sec^4 \theta \, \text{sec } \theta \tan \theta \, d\theta$$

$$= \int u^4 \, du$$

$$= \frac{1}{5} u^5 + C = \frac{1}{5} \sec^5 \theta + C$$

$$(4) \int e^{7x} (1 + e^{7x})^5 \, dx$$

$$u = 1 + e^{7x} \\ du = 7e^{7x} \, dx \\ \frac{du}{7} = e^{7x} \, dx$$

$$= \int \frac{u^5}{7} \, du$$

$$= \frac{u^6}{42} + C = \frac{(1 + e^{7x})^6}{42} + C$$

$$(5) \int \frac{\tan^{-1} 2x}{1+4x^2} \, dx$$

$$\text{let } u = \tan^{-1} 2x \\ du = \frac{1}{1+4x^2} \cdot 2 \, dx$$

$$= \int \frac{u \, du}{2}$$

$$= \frac{u^2}{4} + C$$

$$= \frac{(\tan^{-1} 2x)^2}{4} + C$$

note: not  $\tan^{-2} 2x$

$$(6) \int \sqrt{3 + \tan \theta} \sec^2 \theta \, d\theta$$

$$\begin{aligned} \text{let } u &= 3 + \tan \theta \\ du &= \sec^2 \theta \, d\theta \end{aligned}$$

$$= \int u^{1/2} \, du$$

$$= \frac{2}{3} u^{3/2} + C$$

$$= \frac{2}{3} (3 + \tan \theta)^{3/2} + C$$