

$$1. \int \sin^2 x \, dx$$

$$\textcircled{1} \sin x \cdot \frac{\sin^2 x}{1 - \cos^2 x} \quad \textcircled{2} t = \cos x \quad \frac{dt}{dx} = -\sin x \quad \textcircled{3} \int -(1-t^2) dt \quad \textcircled{4} \frac{1}{3} \cos^3 x - \cos x + C$$

$$2. \int \frac{1}{\sin x} \, dx$$

$$\textcircled{1} \sin x \cdot \frac{\sin^2 x}{1 - \cos^2 x} \quad \textcircled{2} t = \cos x \quad \frac{dt}{dx} = -\sin x \quad \textcircled{3} \int \frac{1}{(t-1)(t+1)} dt \quad \textcircled{4} \frac{1}{2} \ln \left| \frac{\cos x - 1}{\cos x + 1} \right|$$

$$\int \frac{1}{1-t^2} dt = \frac{1}{2} \int \frac{1}{t-1} - \frac{1}{t+1} dt = \frac{1}{2} \ln \left| \frac{t-1}{t+1} \right|$$

$$3. \int \tan^2 x \, dx$$

$$\textcircled{1} \tan x \cdot \tan x = \tan x \cdot (\sec^2 x - 1) = \tan \sec^2 x - \tan x$$

$$\textcircled{2} \int \tan \sec^2 x - \tan x \, dx = \frac{1}{3} \tan^3 x + \ln |\cos x| + C$$

($\because \sec^2 x = (\tan x)'$, $\int \tan \ln dx = \frac{1}{2} \ln^2 |x| + C$)

$$4. \int \tan^3 x \, dx$$

$$\textcircled{1} \frac{\sin x}{\cos x} \, dx \quad \textcircled{2} \int \frac{-1}{t} dt \quad \textcircled{3} -\ln |\cos x| + C$$

$$t = \cos x \quad \frac{dt}{dx} = -\sin x \, dx$$

$$= -\ln |t| + C$$

$$5. \int \tan^2 x \, dx$$

$$\textcircled{1} \tan^2 x = \sec^2 x - 1 \quad \textcircled{2} \sec^2 x = (\tan x)'$$

$$\therefore \int \sec^2 x - 1 \, dx = \int \tan^2 x \, dx$$

$$= \int \tan^2 x \, dx$$

$$6. \int \sin^2 x \, dx$$

$$\textcircled{1} \cos^2 x = \cos^2 x - \sin^2 x = 1 - 2\sin^2 x$$

$$\therefore \sin^2 x = \frac{1 - \cos 2x}{2}$$

$$\textcircled{2} \int \frac{1 - \cos 2x}{2} \, dx \quad \textcircled{3} \frac{1}{2} x - \frac{1}{4} \sin 2x + C$$

$$= \frac{1}{2} \left(x - \sin 2x \cdot \frac{1}{2} \right) + C$$

$$7. \int \frac{\ln x}{x} \, dx$$

$$\textcircled{1} \int \frac{1}{x} \cdot \ln x \, dx = \ln x \cdot \ln x - \int \ln x \cdot \frac{1}{x} \, dx + C$$

$$\textcircled{2} \int \frac{\ln x}{x} \, dx = \left(\ln x \right)^2$$

$$\therefore \int \frac{\ln x}{x} \, dx = \frac{(\ln x)^2}{2} + C$$

$$8. \int x e^x \, dx = x e^x - e^x + C$$

$$9. \int \ln x \, dx = x \ln x - x$$

> 외우면 편이 좋다.