

### **Integral of $\tan^3(x)$**

Use what you have learned to integrate the function  $\tan^3(x)$ .

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$$u = \tan x \Rightarrow du = \sec^2 x dx$$

$$\begin{aligned} & \int \tan^3 x \, dx \\ &= \int (\sec^2 x - 1) \tan x \, dx \\ &= \int \sec^2 x \tan x \, dx - \int \tan x \, dx \\ &= \int u \, du - (-\ln|\cos x| + C_1) \\ &= \frac{u^2}{2} + C_2 + \ln|\cos x| + C_3 \\ &= \frac{\tan^2 x}{2} + \ln|\cos x| + C \end{aligned}$$

$$\begin{aligned} & \int \tan x \, dx \\ &= \int \frac{\sin x}{\cos x} \, dx \\ &= \int \frac{-1}{v} \, dv \\ &= -\ln|v| + C \\ &= -\ln|\cos x| + C \end{aligned}$$