# Finding Indefinite Integrals

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Finding the indefinite integral of $\tan(x)$

$$\begin{aligned}
&\int \tan(x)\ dx \\
&= \int \frac{\sin(x)}{\cos(x)}\ dx \\
&= \int -\frac{du}{u} \\
&= -\ln|u| + C \\
&= -\ln|\cos(x)| + C
\end{aligned}$$

Finding the indefinite integral of $\cot(x)$ $\int \cot(x)\ dx$

$$\begin{aligned}
&= \int \frac{\cos(x)}{\sin(x)}\ dx \\
&= \int \frac{du}{u} \\
&= \ln|u| + C \\
&= \ln|\sin(x)| + C
\end{aligned}$$

Finding the indefinite integral of $\sec^3(x)$

$$\begin{aligned}
&\int \sec^3(x)dx \\
&\text{Let } du = \sec^2(x)dx \therefore u = \tan(x) \\
&dv = \sec(x) \therefore v = \sec(x)\tan(x) \\
&= \sec(x)\tan(x) - \int \sec(x)\tan^2(x)dx \\
&= \sec(x)\tan(x) - \int \sec(x)\tan^2(x)dx \\
&= \sec(x)\tan(x) - \int \sec(x)\sec^2(x)dx + \int sec(x)dx \\
&= \frac{1}{2}\sec(x)\tan(x) + \frac{1}{2}\ln|\sec(x) + \tan(x)| + C
\end{aligned}$$

Finding the limit with IHopital's Rule

$$\lim_{x \to 4} \frac{x^2 - 16}{x - 4}$$
$$= \frac{0}{0}\text{.......indeterminate form}$$
According to I.Hopital's Rule keep
differentiating till you reach determinate form
$$= \lim_{x \to 4} \frac{2x}{1}$$
$$= \frac{8}{1}$$
$$= 8$$