

Integral of $\sec(x)$

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$$\begin{aligned}\int \sec(x) \, dx &= \int \sec(x) \left(\frac{\sec(x) + \tan(x)}{\sec(x) + \tan(x)} \right) dx \\ &= \int \frac{\sec^2(x) + \sec(x) \tan(x)}{\sec(x) + \tan(x)} dx\end{aligned}$$

Let $u = \sec(x) + \tan(x)$, then $du = \sec(x) \tan(x) + \sec^2(x) \, dx$

$$\begin{aligned}\int \sec(x) \, dx &= \int \frac{1}{u} \, du \\ &= \ln |u| + C \\ &= \ln |\sec(x) + \tan(x)| + C\end{aligned}$$