Integral of $\sec(x)$

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$$\int \sec(x)\, dx = \int \sec(x) \left(\frac{\sec(x) + \tan(x)}{\sec(x) + \tan(x)} \right) dx$$

$$= \int \frac{\sec^2(x) + \sec(x)\tan(x)}{\sec(x) + \tan(x)}\, dx$$

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

$$\int \sec(x)\, dx = \int \frac{1}{u}\, du$$

$$= \ln|u| + C$$

$$= \ln\left| \sec(x) + \tan(x) \right| + C$$