

Demonstration

Example: $\int \sec(x) dx$

$$= \int \sec(x) \cdot \frac{\sec(x) + \tan(x)}{\sec(x) + \tan(x)} dx$$

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

$$u = \sec(x) + \tan(x)$$

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

$$du = (\sec(x)\tan(x) + \sec^2(x)) dx$$

$$= \int \frac{1}{u} du = \ln|u| + C$$

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