$$\int \cot x \, dx$$

Solution

$$\int \cot x \, dx = \int \frac{\cos x}{\sin x} \, dx$$

Let $u = \sin x$, so $du = \cos x \, dx$. Then

$$\int \frac{\cos x}{\sin x} \, dx = \int \frac{1}{u} \, du = \ln |u| + C = \ln |\sin x| + C.$$