

Dr Oliver  
Mathematics

## Dr Oliver Mathematics Integration: Part 3

1. Find

$$\int_{\frac{1}{4}\pi}^{\frac{1}{2}\pi} \frac{\cos x}{\sin x} dx.$$

**Solution**

$$\begin{aligned} \int_{\frac{1}{4}\pi}^{\frac{1}{2}\pi} \frac{\cos x}{\sin x} dx &= \int_{\frac{1}{4}\pi}^{\frac{1}{2}\pi} \frac{\frac{d}{dx}(\sin x)}{\sin x} dx \\ &= [\ln |\sin x|]_{x=\frac{1}{4}\pi}^{\frac{1}{2}\pi} \\ &= \ln |\sin \frac{1}{2}\pi| - \ln |\sin \frac{1}{4}\pi| \\ &= \ln 1 - \ln \frac{\sqrt{2}}{2} \\ &= -\ln \frac{\sqrt{2}}{2} \\ &= \ln \frac{2}{\sqrt{2}} \\ &= \ln \sqrt{2} \text{ or } \underline{\underline{\frac{1}{2} \ln 2.}} \end{aligned}$$