Exercise 25

Evaluate the integral.

$$\int_{\pi/6}^{\pi} \sin\theta \, d\theta$$

Solution

According to part 2 of the fundamental theorem of calculus,

$$\int_a^b f(x)\,dx = F(b) - F(a),$$

where F is an antiderivative of f.

$$\begin{aligned}\int_{\pi/6}^{\pi} \sin\theta \, d\theta &= (-\cos\theta)\Big|_{\pi/6}^{\pi} \\ &= -\left(\cos\pi - \cos\frac{\pi}{6}\right) \\ &= -\left(-1 - \frac{\sqrt{3}}{2}\right) \\ &= 1 + \frac{\sqrt{3}}{2}\end{aligned}$$