

PROOF OF FORMULA 3.541.6

$$\int_0^{\infty} \frac{e^{-\mu x} dx}{\cosh x} = \beta\left(\frac{\mu+1}{2}\right)$$

The *beta function* is defined in entry **8.371.1** by

$$\beta(a) = \int_0^1 \frac{t^{a-1} dt}{1+t}.$$

The change of variables $t = e^{-2x}$ yields

$$\begin{aligned} \int_0^{\infty} \frac{e^{-\mu x} dx}{\cosh x} &= 2 \int_0^{\infty} \frac{e^{-(\mu+1)x} dx}{1+e^{-2x}} \\ &= \int_0^1 \frac{t^{\frac{\mu-1}{2}} dt}{1+t}. \end{aligned}$$

This is the result.