PROOF OF FORMULA 3.417.2

$$\int_{-\infty}^{\infty} \frac{x\,dx}{a^2e^x - b^2e^{-x}} = \frac{\pi^2}{4ab}$$

The change of variables $t = e^x$ gives

$$\int_{-\infty}^{\infty} \frac{x\,dx}{a^2e^x - b^2e^{-x}} = \int_0^{\infty} \frac{\ln t\,dt}{a^2t^2 - b^2}.$$

The result now follows from

$$\int_0^{\infty} \frac{\ln t\,dt}{a^2t^2 - b^2} = \frac{\pi^2}{4ab}$$

given as entry 4.231.10.