

PROOF OF FORMULA 3.522.4

$$\int_0^{\infty} \frac{dx}{(b^2 + x^2) \cosh \pi x} = \frac{\beta(b + 1/2)}{b}$$

This is the special case $a = \pi$ in entry **3.522.3**. Therefore

$$\int_0^{\infty} \frac{dx}{(b^2 + x^2) \cosh \pi x} = \frac{2}{b} \sum_{k=0}^{\infty} \frac{(-1)^k}{2b + (2k + 1)}.$$

The result now follows from the expansion

$$\beta(x) = \sum_{k=0}^{\infty} \frac{(-1)^k}{k + x}.$$