

FORMULA 3.524.3

$$\begin{aligned} \int_0^\infty \frac{\sinh ax}{\sinh bx} \frac{dx}{x^p} &= \Gamma(1-p) \sum_{k=0}^{\infty} \left(\frac{1}{[b(2k+1)-a]^{1-p}} - \frac{1}{[b(2k+1)+a]^{1-p}} \right) \\ &= \frac{\Gamma(1-p)}{(2b)^{1-p}} \left[\zeta\left(\frac{b-a}{2b}, 1-p\right) - \zeta\left(\frac{b+a}{2b}, 1-p\right) \right] \end{aligned}$$