

PROOF OF FORMULA 4.257.1

$$\int_0^\infty \frac{x^\nu}{(x+b)(x+c)} \ln\left(\frac{x}{b}\right) dx = \frac{\pi}{(c-b)\sin\pi\nu} \left[c^\nu \ln \frac{c}{b} + \pi (b^\nu - c^\nu) \cot \pi\nu \right]$$

The change of variables $x = bt$ gives

$$\int_0^\infty \frac{x^\nu}{(x+b)(x+c)} \ln\left(\frac{x}{b}\right) dx = b^{\nu-1} \int_0^\infty \frac{t^\nu \ln t}{(t+1)(t+c/b)} dt.$$

This last integral appears in entry **4.252.1** and the result follows from there.