

PROOF OF FORMULA 3.551.2

$$\int_0^{\infty} x^{\mu-1} e^{-bx} \cosh ax \, dx = \frac{\Gamma(\mu)}{2} [(b-a)^{-\mu} + (b+a)^{-\mu}]$$

Write the integral as

$$\int_0^{\infty} x^{\mu-1} e^{-bx} \cosh ax \, dx = \frac{1}{2} \int_0^{\infty} x^{\mu-1} e^{-(b-a)x} \, dx + \frac{1}{2} \int_0^{\infty} x^{\mu-1} e^{-(b+a)x} \, dx.$$

Make the change of variables $t = (b-a)x$ in the first integral and $t = (b+a)x$ in the second one to obtain the result.