

PROOF OF FORMULA 4.293.1

$$\int_0^1 x^{\mu-1} \ln(1+x) dx = \frac{1}{\mu} [\ln 2 - \beta(\mu+1)]$$

Integrate by parts to obtain

$$\int_0^1 x^{\mu-1} \ln(1+x) dx = \frac{\ln 2}{\mu} - \frac{1}{\mu} \int_0^1 \frac{x^\mu dx}{1+x}.$$

The result now follows from the definition of the incomplete beta function

$$\beta(t) = \int_0^1 \frac{x^{t-1} dx}{1+x}$$

that is given as entry 8.371.1