PROOF OF FORMULA 3.241.1

$$\int_0^1 \frac{x^{\mu-1}\,dx}{1+x^p} = \frac{1}{p}\beta\left(\frac{\mu}{p}\right)$$

The β function in the answer is the *incomplete beta function* defined by

$$\beta(a) = \int_0^1 \frac{t^{a-1}\,dt}{1+t}.$$

The change of variables $t = x^p$ shows that the requested evaluation is

$$\int_0^1 \frac{x^{\mu-1}\,dx}{1+x^p} = \frac{1}{p}\int_0^1 \frac{t^{\mu/p-1}\,dx}{1+t} = \frac{1}{p}\beta\left(\frac{\mu}{p}\right).$$