PROOF OF FORMULA 3.196.3

$$\int_a^b (x-a)^{\mu-1}(b-x)^{\nu-1}\,dx = (b-a)^{\mu+\nu-1}B(\mu,\nu)$$

Let $y = (x-a)/(b-a)$ to obtain

$$\int_a^b (x-a)^{\mu-1}(b-x)^{\nu-1}\,dx = (b-a)^{\mu+\nu-1}\int_0^1 y^{\mu-1}(1-y)^{\nu-1}\,dy.$$

The result follows from the basic integral representation for the beta function

$$B(a,b) = \int_0^1 x^{a-1}(1-x)^{b-1}\,dx$$