PROOF OF FORMULA 3.192.1

$$\int_0^1 \frac{x^p \, dx}{(1-x)^p} = \frac{\pi p}{\sin(\pi p)}$$

The integral representation

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

shows that the claimed formula is

$$B(p+1, 1-p) = \frac{\Gamma(1+p)\,\Gamma(1-p)}{\Gamma(2)}.$$

The result now follows from $\Gamma(z+1) = z\Gamma(z)$ and $\Gamma(z)\Gamma(1-z) = \pi/\sin \pi z$.