

PROOF OF FORMULA 4.269.3

$$\int_0^1 \sqrt{-\ln x} x^{p-1} dx = \frac{1}{2} \sqrt{\frac{\pi}{p^3}}$$

Let $u = -\ln x$ to obtain

$$\int_0^1 \sqrt{-\ln x} x^{p-1} dx = \int_0^\infty \sqrt{u} e^{-pu} du.$$

The change of variables $t = pu$ and the value

$$\int_0^\infty t^{1/2} e^{-t} dt = \Gamma\left(\frac{3}{2}\right) = \frac{\sqrt{\pi}}{2}$$

give the result.