

PROOF OF FORMULA 4.235.1

$$\int_0^\infty \ln x \frac{(1-x)x^{n-2} dx}{1-x^{2n}} = -\frac{\pi^2}{4n^2} \tan^2\left(\frac{\pi}{2n}\right)$$

Start with

$$\int_0^\infty \ln x \frac{(1-x)x^{n-2} dx}{1-x^{2n}} = \int_0^\infty \ln x \frac{x^{n-2} dx}{1-x^{2n}} - \int_0^\infty \ln x \frac{x^{n-1} dx}{1-x^{2n}}$$

and use Entry **4.231.12**

$$\int_0^\infty \frac{x^{p-1} \ln x}{1-x^q} dx = -\frac{\pi^2}{q^2 \sin^2(\pi p/q)}$$

to obtain the result.