

**PROOF OF FORMULA 4.235.3**

$$\int_0^\infty \ln x \frac{(1-x^2)x^{n-3}}{1-x^{2n}} dx = -\frac{\pi^2}{4n^2} \tan^2\left(\frac{\pi}{n}\right)$$

Start with

$$\int_0^\infty \ln x \frac{(1-x^2)x^{n-3}}{1-x^{2n}} dx = \int_0^\infty \ln x \frac{x^{n-3}}{1-x^{2n}} dx - \int_0^\infty \ln x \frac{x^{n-1}}{1-x^{2n}} dx.$$

The result now follows from entry **4.254.2**

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