PROOF OF FORMULA 3.244.4

$$\int_{-\infty}^{\infty} \frac{x^{2m} - x^{2n}}{1 - x^{2l}}\, dx = \frac{\pi}{l}\left[\cot\left(\frac{2m+1}{2l}\pi\right) - \cot\left(\frac{2n+1}{2l}\pi\right)\right]$$

Write the integrals as the diffrence of two principal value integrals

$$\int_{-\infty}^{\infty} \frac{x^{2m} - x^{2n}}{1 - x^{2l}}\, dx = 2\int_{0}^{\infty} \frac{x^{2m}\, dx}{1 - x^{2l}} - 2\int_{0}^{\infty} \frac{x^{2n}\, dx}{1 - x^{2l}}.$$

The result now follows from entry 3.241.3

$$\int_{0}^{\infty} \frac{x^{p-1}\, dx}{1 - x^{q}} = \frac{\pi}{q}\cot\left(\frac{\pi p}{q}\right).$$