FORMULA 3.661.4

$$\int_0^\pi \frac{dx}{(a + b\cos x)^{n+1}} = \frac{1}{2}\int_0^{2\pi} \frac{dx}{(a + b\cos x)^{n+1}}$$

$$= \frac{\pi}{(a^2 - b^2)^{\frac{n+1}{2}}} P_n\left(\frac{a}{\sqrt{a^2 - b^2}}\right)$$

$$= \frac{\pi}{2^n(a+b)^n\sqrt{a^2 - b^2}} \sum_{k=0}^{n} \frac{(2n - 2k - 1)!!\,(2k - 1)!!}{k!\,(n-k)!}\left(\frac{a+b}{a-b}\right)^k \quad \text{for } a > |b|$$