

FORMULA 3.661.3

$$\begin{aligned}\int_0^\pi (a + b \cos x)^n dx &= \frac{1}{2} \int_0^{2\pi} (a + b \cos x)^n dx \\ &= \pi (a^2 - b^2)^{n/2} P_n \left(\frac{a}{\sqrt{a^2 - b^2}} \right) \\ &= \frac{\pi}{2^n} \sum_{k=0}^{\lfloor n/2 \rfloor} \frac{(-1)^k (2n - 2k)!}{k!(n - k)!(n - 2k)!} a^{n-2k} (a^2 - b^2)^k \quad \text{for } a^2 > b^2\end{aligned}$$