

! For an efficient use of these tables, first read [HowTo.pdf](#).

**T2.54C.** Integrands involving powers of trigonometric functions and powers of  $(a + b x^n)$  for  $n = 1, 2, 3, 4$ , on the intervals  $(0, \pi)$  and  $(0, r\pi)$ .

$$1. \int_0^\pi x \sin^p x \, dx = \frac{\pi^2}{2^{p+1}} \frac{\Gamma(p+1)}{[\Gamma(\frac{p}{2}+1)]^2}, \quad p > -1.$$

$$2. \int_0^\pi x \cos^{2m} x \, dx = \frac{\pi^2}{2} \frac{(2m-1)!!}{(2m)!!}.$$

$$3. \int_0^\pi \frac{x \sin(2n+1)x}{\sin x} \, dx = \frac{1}{2} \pi^2, \quad n = 0, 1, 2, \dots$$

$$4. \int_0^\pi \frac{x \sin 2nx}{\sin x} \, dx = -4 \sum_{k=1}^n (2k-1)^{-2}, \quad n = 1, 2, 3, \dots$$

$$5. \int_0^{k\pi} x \sin^n x \, dx = \begin{cases} \frac{\pi^2}{2} \frac{(2m-1)!!}{(2m)!!} k^2, & n = 2m, \\ (-1)^{k+1} \pi \frac{(2m)!!}{(2m+1)!!} k, & n = 2m+1, \end{cases} \quad k \in \mathbb{N}.$$