! For an efficient use of these tables, first read `HowTo.pdf`.

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

1. $$\int_0^{\pi/2} x\,\cos^n x\,dx - \sum_{k=0}^{m-1} \frac{(n-2k+1)(n-2k+3)\dots(n-1)}{(n-2k)(n-2k+2)\dots n}\,\frac{1}{n-2k} + \begin{cases} \dfrac{\pi}{2}\cdot\dfrac{(2m-2)!!}{(2m-1)!!}, & n = 2m-1, \\ \dfrac{\pi^2}{8}\cdot\dfrac{(2m-1)!!}{(2m)!!}, & n = 2m. \end{cases}$$

2. $$\int_0^{\pi/2} x^p\,\cos^m x\,dx = -\frac{p(p-1)}{m^2}\int_0^{\pi/2} x^{p-2}\,\cos^m x\,dx + \frac{m-1}{m}\int_0^{\pi/2} x^p\,\cos^{m-2} x\,dx, \quad m > 1,\ p > 1.$$

3. $$\int_0^{\pi/2} \frac{x^2\,dx}{\sin^2 x} = \pi\,\ln 2.$$

4. $$\int_0^{\pi/2} \frac{x^2\,\cos x}{\sin^2 x}\,dx = -\frac{\pi^2}{4} + 4\mathbf{G}.$$

5. $$\int_0^{\pi/2} \frac{x^3\,\cos x}{\sin^3 x}\,dx = -\frac{\pi^3}{16} + \frac{3}{2}\pi\,\ln 2.$$

6. $$\int_0^{\pi/2} \frac{x\,\cos^{p-1} x}{\sin^{p+1} x}\,dx = \frac{\pi}{2p}\,\sec\frac{\pi p}{2}, \quad p < 1.$$

7. $$\int_0^{\pi/2} x\,\cos^p x\,\tan x\,dx = \frac{\pi}{2^{p+1}p}\cdot\frac{\Gamma(p+1)}{\left[\Gamma\left(\frac{p}{2}+1\right)\right]^2}, \quad p > -1.$$

8. $\displaystyle\int_0^{\pi/2} x \sin^p x \cot x \, dx = \frac{\pi}{2p} - \frac{2^{p-1}}{p} \mathrm{B}\left(\frac{p+1}{2}, \frac{p+1}{2}\right), \quad p > -1.$