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

T2.44A. Integrands involving powers of trigonometric functions and rational trigonometric functions on the interval $(0, \pi/4)$.

1. $$\int_0^{\pi/4} \frac{\tan^j x\, dx}{1+\cos(m\pi/n)\,\sin 2x}$$
$$= \begin{cases} \dfrac{1}{2n}\csc(m\pi/n)\displaystyle\sum_{k=0}^{n-1}(-1)^{k-1}\sin\frac{km\pi}{n}\left[\psi\left(\frac{n+j+k}{2n}\right)-\psi\left(\frac{j+k}{2n}\right)\right], & m+n \text{ odd}, \\ \dfrac{1}{n}\csc(m\pi/n)\displaystyle\sum_{k=0}^{(n-1)/2}(-1)^{k-1}\sin\frac{km\pi}{n}\left[\psi\left(\frac{n+j-k}{n}\right)-\psi\left(\frac{j+k}{n}\right)\right], & m+n \text{ even}, \end{cases}$$
where j is a natural number.

2. $$\int_0^{\pi/4} \frac{\tan^\mu x\, dx}{1+\sin x\,\cos x} = \frac{1}{3}\left[\psi\left(\frac{\mu+2}{3}\right)-\psi\left(\frac{\mu+1}{3}\right)\right], \quad \Re\{\mu\} > -1.$$

3. $$\int_0^{\pi/4} \frac{\tan^\mu x\, dx}{1-\sin x\,\cos x} = \frac{1}{3}\left[\beta\left(\frac{\mu+2}{3}\right)+\beta\left(\frac{\mu+1}{3}\right)\right], \quad \Re\{\mu\} > -1.$$

4. $$\int_0^{\pi/4} \frac{\tan^\mu x\, dx}{1-\sin^2 x\,\cos^2 x} = \frac{1}{12}\Big\{-\psi\left(\frac{\mu+1}{6}\right)-\psi\left(\frac{\mu+2}{6}\right)$$
$$+\psi\left(\frac{\mu+4}{6}\right)+\psi\left(\frac{\mu+5}{6}\right)+2\psi\left(\frac{\mu+2}{3}\right)-2\psi\left(\frac{\mu+1}{3}\right)\Big\}, \quad \Re\{\mu\} > -1.$$
