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

T2.72E. Integrands involving logarithms and exponentials on the interval $(0, 2\pi)$.

1. $$\int_0^{2\pi} \ln x \sin nx \, dx = -\frac{1}{n}\,[\ln(2n\pi) - \mathrm{Ci}(2n\pi) + \gamma_e].$$

2. $$\int_0^{2\pi} \ln x \cos nx \, dx = -\frac{1}{n}\left[\mathrm{Si}(2n\pi) + \frac{\pi}{2}\right].$$

3. $$\int_0^{2\pi} \ln \frac{1 - 2a\cos x + a^2}{1 - 2a\cos nx + a^2} \cos mx \, dx = \begin{cases} 2\pi\left(\dfrac{n}{m}\,a^{m/n} - \dfrac{a^m}{m}\right), & a^2 \le 1, \\ 2\pi\left(\dfrac{n}{m}\,a^{-m/n} - \dfrac{a^{-m}}{m}\right), & a^2 \ge 1. \end{cases}$$

4. $$\int_0^{2\pi} \ln(1 - 2a\cos x + a^2) \cos nx \, dx = \begin{cases} -\dfrac{2\pi\, a^n}{n}, & a^2 < 1, \\ -\dfrac{2\pi}{na^n}, & a^2 > 1. \end{cases}$$

5. $$\int_0^{2\pi} \ln(1 - 2a\cos x + a^2) \sin nx \sin x \, dx = \pi\left(\frac{a^{n+1}}{n+1} - \frac{a^{n-1}}{n-1}\right), \quad a^2 > 1.$$

6. $$\int_0^{2\pi} \ln(1 - 2a\cos x + a^2)\, \cos nx \cos x \, dx = -\pi\left(\frac{a^{n+1}}{n+1} + \frac{a^{n-1}}{n-1}\right), \quad a^2 < 1.$$