

a)

Find the coefficients in the expansion

$$\sum_{\substack{n=-\infty \\ n \neq 0}}^{\infty} \frac{e^{inx}}{2n^2} = a_0 + \sum_{n=1}^{\infty} a_n \cos(nx) + b_n \sin(nx).$$

b)

Consider the known series

$$x = 2 \sum_{n=1}^{\infty} (-1)^{n+1} \frac{\sin nx}{n}, \quad (-\pi < x < \pi)$$

Determine N so that the mean square error

$$\frac{1}{2\pi} \int_{-\pi}^{\pi} \left(x - 2 \sum_{n=1}^N (-1)^{n+1} \frac{\sin nx}{n} \right)^2 dx$$

is guaranteed to be less than 10^{-5} .