

SERIES SUM USING Parseval's theorem

系級: _____ 學號: _____ 姓名: _____

$$f(t) = \begin{cases} t, & 0 < t < \pi \\ 0, & -\pi < t < 0 \end{cases}, f(t) = a_0 + \sum_{n=1}^{\infty} (a_n \cos(nt) + b_n \sin(nt))$$

(1) 求 a_0, a_n, b_n 。(2) n 取多少時, $\int_{-\pi}^{\pi} f^2(t)dt$ 有 95% 的準確度。

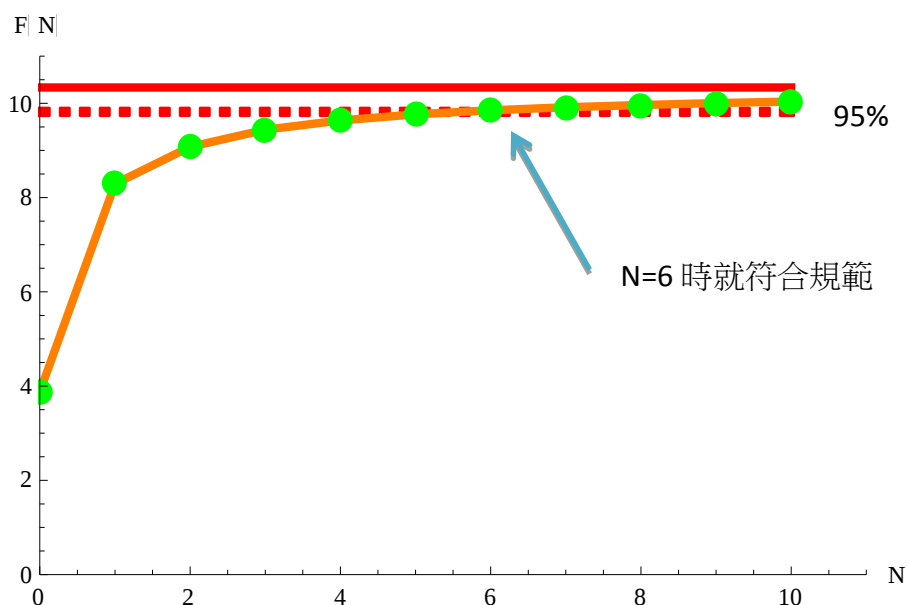
$$a_0 = \frac{\pi}{4}$$

$$a_n = \frac{-1 + \cos(n\pi)}{n^2 \pi}$$

$$b_n = \frac{-n\pi \cos(n\pi)}{n^2 \pi}$$

$$\int_{-\pi}^{\pi} f^2(t)dt = \pi[2a_0^2 + \sum_{n=1}^{\infty} (a_n^2 + b_n^2)] \quad (\text{Parseval's 定理})$$

$$\int_{-\pi}^{\pi} f^2(t)dt = \frac{\pi^3}{3}, N=10 \Rightarrow \int_{-\pi}^{\pi} f^2(t)dt = \pi[2a_0^2 + \sum_{n=1}^N (a_n^2 + b_n^2)] = F(N)$$



延伸閱讀：J.T. Chen, S.W. Chyuan, D.W. You, F.C. Wong, Normalized quasi-static mass - A new definition for multi-support motion problems (1997) Vol. 26, pp.129-142. Finite Elements in Analysis and Design. (SCI and EI) (Fourier 好好學，可以應用在地震工程上)