Engineering Mathematics Ⅱ Hw#2 日河工 2B

9 March 2005

1) Let $f(x) = \begin{matrix} 1 & for \quad 0 \le x \le \pi/2 \\ 2 & for \quad \pi/2 < x \le \pi \end{matrix}$

(a)Find the Fourier cosine series of $f(x)$ on $[0, \ \pi]$

(b)Find the Fourier sine series of $f(x)$ on $[0, \ \pi]$

(c)Plot the Fourier cosine series obtained in (a)

(d)Plot the Fourier sine series obtained in (b)

(e)Make comparisons between (a), (c) and (b), (d) (hint: convergence in the interval and at the endpoints, convergence rate, Gibbs Phenomenon,…...)

2) Let $f(x) = \begin{matrix} 0 & for \quad -\pi \le x \le 0 \\ x & for \quad 0 < x \le \pi \end{matrix}$ (Section 13.5 Problem 3.)

(a)Write the Fourier series of $f(x)$ on $[-\pi, \ \pi]$ and show that this series converges to $f(x)$ on $(-\pi, \ \pi)$.

(b)Show that this series can be integrated term-by-term.

(c)Use the results of (a) and (b) to obtain a trigonometric series expansion for $\int_{-\pi}^{\pi} f(x) \, dt$ on $[-\pi, \ \pi]$.