

Practice Problems for Fourier Series

MATH2004, Winter 2008

1. Find the Fourier series of the function $f(x) = \begin{cases} 1, & 0 < x < \pi, \\ 0 & -\pi < x < 0, \end{cases} f(x + 2\pi) = f(x),$
 $-\infty < x < \infty.$

2. Find the limit of the right-hand side of the Fourier series in Question 1 at the following points: $x = 4, -10, 13\pi.$

3. Find the Fourier sine series of the function $f(x) = \begin{cases} \frac{\pi}{2} - x, & 0 < x < \frac{\pi}{2}, \\ 0, & \frac{\pi}{2} < x < \pi. \end{cases}$

4. $f(x) = e^x, 0 < x < 1.$ Find the cosine series of this function.

5. $f(x) = e^x, 0 < x < 1.$ Find the sine series of this function.

6. Find the Fourier series of the function $f(x) = x - x^3, -1 < x < 1, f(x + 2) = f(x).$

7. Find the Fourier series of $F(x) = \int_0^x (t - t^3) dt = \frac{x^2}{2} - \frac{x^4}{4}, -1 < x < 1, F(x + 2) = F(x).$