Fourier Series

The **Fourier series** of f on the interval [-L, L] is

$$f(x) \sim \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos(\frac{n\pi x}{L}) + \sum_{n=1}^{\infty} b_n \sin(\frac{n\pi x}{L}).$$

where a_n and b_n are given by the formulas

$$a_n = \frac{1}{L} \int_{-L}^{L} f(x) \cos(\frac{n\pi x}{L}) dx \qquad n = 0, 1, 2, \dots$$

$$b_n = \frac{1}{L} \int_{-L}^{L} f(x) \sin(\frac{n\pi x}{L}) dx \qquad n = 1, 2, \dots$$

Fourier Cosine and Sine Series

The Fourier cosine series of f(x) on [0, L] is

$$\frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos(\frac{n\pi x}{L}).$$

where

$$a_n = \frac{2}{L} \int_0^L f(x) \cos(\frac{n\pi x}{L}) dx$$
 $n = 0, 1, 2, ...$

The Fourier sine series of f(x) on [0, L] is

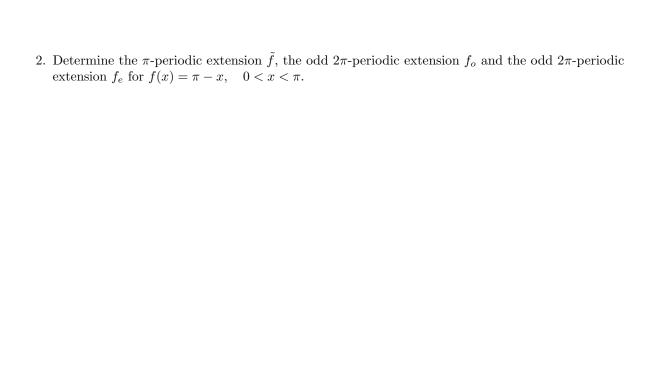
$$\sum_{n=1}^{\infty} b_n \sin(\frac{n\pi x}{L}).$$

where

$$b_n = \frac{2}{L} \int_0^L f(x) \sin(\frac{n\pi x}{L}) dx \quad n = 1, 2, \dots$$

10.3 Fourier Series & 10.4 Fourier Cosine and Sine Series

1. Compute the Fourier series for function $f(x) = |x|, -\pi < x < \pi$.



3. Determine the Fourier sine series and cosine series for $f(x) = \pi - x$, $0 < x < \pi$.