Exercise 3.3.18

For continuous functions,

(a) Under what conditions does $f(x)$ equal its Fourier series for all x, $-L \leq x \leq L$?

(b) Under what conditions does $f(x)$ equal its Fourier sine series for all x, $0 \leq x \leq L$?

(c) Under what conditions does $f(x)$ equal its Fourier cosine series for all x, $0 \leq x \leq L$?

Solution

Part (a)

Assuming that $f(x)$ is continuous, it's equal to its Fourier series if $f(-L) = f(L)$.

Part (b)

Assuming that $f(x)$ is continuous, it's equal to its Fourier sine series if $f(0) = f(L) = 0$.

Part (c)

Assuming that $f(x)$ is continuous, it's equal to its Fourier cosine series.