MTH 352/652: Homework #5

Due Date: March 01, 2024

1 Problems for Everyone

1. pg. 81, #3.2.14-3.2.16, #3.2.20

2. pg. 87-88, #3.2.34-#3.2.25

3. pg. 95, #3.3.1-3.3.3

4. pg. 97, #3.4.3

5. Find the Fourier series of the function $|\sin(x)|$ in the interval $(-\pi, \pi)$. Use it to find the following sums:

$$\sum_{n=1}^{\infty} \frac{1}{4n^2 - 1} \text{ and } \sum_{n=1}^{\infty} \frac{(-1)^n}{4n^2 - 1}.$$

6. Let $\phi(x) = x$.

   (a) Find the Fourier series of $\phi(x)$ on the interval $(0, L)$, where $L > 0$ is a constant.

   (b) Integrating term by term, find the Fourier series of $x^2/2$ on the interval $(0, L)$. Do not forget about the a_0 term.

   (c) Find the sum of the following series

   $$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2}.$$

   (d) Find the Fourier series of x^3 and x^4 on the interval $(0, L)$.

   (e) Find the sum of the following series

   $$\sum_{n=1}^{\infty} \frac{(-1)^n}{n^4}.$$