Homework 3A

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MATH 241-910 :Calculus IV

May 30, 2017

Problem 0. Reading: section 3.3.1-3.3.5 in Haberman. *Optional reading:* section 3.4-3.5 in Haberman

Problem 1. (*Sketch Fourier series*)
Haberman 3.2.1 (b)(c)(g)

Problem 2. (*Sketch Fourier series and compute the Fourier coefficients*)
Haberman 3.2.2 (c)(d)(g)

Problem 3. Consider the function $f(x) = x$ for $0 \leq x \leq L$.

1. Sketch the Fourier sine series of $f(x)$.

2. Write $f(x)$ as the Fourier sine series.

Problem 4. Consider the function $f(x) = x^2$ for $0 \leq x \leq L$.

1. Sketch its Fourier cosine series.

2. Write $f(x)$ as Fourier cosine series.

3. Use the series in part (b) at $x = L$ to show

$$\frac{\pi^2}{6} = \sum_{i=1}^{\infty} \frac{1}{n^2} = 1 + \frac{1}{2^2} + \frac{1}{3^2} \cdots \tag{1}$$

Optional exercise: Below are exercise proposed in class and some additional problems. These are for your own benefit and may be helpful for your understanding of the material It is not required to turn them in. It is suggested that you at least read those problems.

Problem A. (*Fourier series, sine series, and cosine series*)
Haberman 3.3.1 (a)(c)(d)

Problem B. (*Convergence of Fourier series*) Haberman 3.3.18

Due: June 1 (Children's day!), 2017, in class