Math 309 Quiz 5 Practice

May 25, 2017

Throughout these questions $L = T/2$ and $\mathcal{P}_T$ will denote the set

$$\mathcal{P}_T = \left\{ f(x) | f(x + T) = f(x) \text{ for all } x \text{ and } \int_{-L}^{L} f(x)^2 dx < \infty \right\}.$$

Problem 1. Determine the Sine series of the function $f(x) = \sin(x) + \sin(3x)$ on the interval $[0, \pi]$.

Problem 2. TRUE or BANANAS: The homogeneous Dirichlet boundary value problem

$$y'' + \lambda y = 0$$

$$y(0) = 0 \quad y(L) = 0$$

will have a nontrivial solution if and only if $\lambda = \frac{n^2 \pi^2}{L^2}$.

Problem 3. TRUE or BANANAS: The homogeneous mixed boundary value problem

$$y'' + \lambda y = 0$$

$$y(0) = 0 \quad y'(L) = 0$$

will have a nontrivial solution if and only if $\lambda = \frac{(n+1/2)^2 \pi^2}{L^2}$.

Problem 4. Calculate the Cosine series of $f(x) = \sin(x)$ on the interval $[0, \pi]$.