Homework - MTH 357

Instructions: Homework is to be neat and organized. **If it's messy it's wrong.** Answers without the necessary supporting work are worth 0. You may discuss problems with others but must always produce your own work and write your own solutions. Copying someone else's homework is considered cheating.

HW3, due 10/21

1. Find the general solution of the ODE $y'' + 9y = r(t)$, where $r(t) = \frac{\pi}{4}|\sin t|$ for $0 < t < 2\pi$ and $r(t + 2\pi) = r(t)$.
2. For $f(x) = x$ on $-\pi < x < \pi$, find the trigonometric polynomial $F(x) = A_0 + \sum_{n=1}^{N} (A_n \cos(nx) + B_n \sin(nx))$ that minimizes $||f - F||_2$ on $(-\pi, \pi)$, for $N = 1, 3, 5$.
3. Refer to problem 2 to complete problem 3. Use software to compute $||f - F||_2$ for $N = 1, 3, 5$. Then use the fact that $\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$ to show $\lim_{N\to\infty} (||f - F||_2)^2 = \lim_{N\to\infty} E^*(N) = 0$.

Supplemental Exercises

11.1: 12-22
11.2: 8-17, 23-28
11.3: 6-16
11.4: 2-8
11.7: 1-12, 16-20
11.8: 1-6, 9-13
11.9: 2-15

12.1: 2-14
12.3: 5-14
12.4: 5-18
12.6: 5-10, 12-15, 21-22
12.7: 2-8
12.9: 4-8, 11-17