Math 436

For Friday, October 13, write out correct solutions to all the in-class exam problems. Turn this in, together with your graded exam.

In doing this assignment, you may consult your course notes, homework, and the *Partial Differential Equations and Boundary Value Problems* by Pinsky. You may not consult any other books or notes. You may not discuss the exam with anyone except me.

Your final score on the exam will be calculated by adding $1/2$ the additional points you receive on your revised solutions to your original score.

Below is a copy of the exam.

On questions with yes or no answers, you must give a reason. Show all your work. If you use a theorem, state that you are using it. There is a table of Fourier series at the end of the exam, which you may find useful. If you find you are doing a horrendous calculation, you are making a mistake or at least making the problem unnecessarily difficult.

1. (10 points) Find the Fourier series of $\cos 7136481x$ on the interval $-\pi < x < \pi$. (Hint: Think!)

2. (10 points) Does the Fourier sine series of x converge to x on $(0, \pi)$? If so, does it converge uniformly?

3. (15 points) Find:

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

b) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n^2}$.

4. (15 points) Find all separated solutions of:

$$u_t = u_{zz}, \qquad -\pi < z < \pi, \ t > 0,$$
$$u_z(-\pi, t) = 0 = u_z(\pi, t),$$