

# MATH 333: Partial Differential Equations

## Problem Set 8, Final version

Due Date: Wed., Nov. 1, 2006

1. Do Exercise 3.1(c). This problem amounts to determining the coefficients  $c_k$  in (3.28).
2. Do Exercise 3.4, parts (a) and (b). You may take as a starting point that (formal) general solution of the PDE plus BCs is  $u(x, t) = \sum_{k=1}^{\infty} c_k e^{-k^2 \pi^2 t} \sin(k\pi x)$ .
3. Do Exercise 3.5, parts (a) and (b). You may take as a starting point that (formal) general solution of the PDE plus BCs is

$$u(x, t) = \frac{a_0}{2} + \sum_{k=1}^{\infty} a_k e^{-k^2 \pi^2 t} \cos(k\pi x).$$

Note that, by including the factor  $(1/2)$  with the constant  $a_0$  we get a single expression for all  $a_k$

$$a_k = 2 \int_0^1 f(x) \cos(k\pi x) dx$$

instead of the exceptional expression for  $c_0$  that is required when we write

$$u(x, t) = \sum_{k=0}^{\infty} c_k e^{-k^2 \pi^2 t} \cos(k\pi x).$$

4. Do Exercise 3.11.
5. Do Exercise 3.12.
6. Read Exercise 3.14. Does the orthogonality of  $\sin(k\pi \cdot)$  with  $\cos(m\pi \cdot)$  go against what you found in Exercise 3.5(b)? Why or why not?
7. Do Exercise 3.15.