

Math 405, homework 12, Fall 2011

Due: Wed Dec 7

Problem 1. Consider the two dimensional Laplace equation on a unit square

$$u_{xx} + u_{yy} = 0, \quad 0 \leq x \leq 1, \quad 0 \leq y \leq 1.$$

Derive the formal solution for the following boundary conditions. Show details of your work.

(a).

$$u(0, y) = 0, \quad u(1, y) = g(y), \quad u(x, 0) = 0, \quad u(x, 1) = 0.$$

(b).

$$u(0, y) = 0, \quad u(1, y) = 0, \quad \frac{\partial u}{\partial n}(x, 0) = 0, \quad \frac{\partial u}{\partial n}(x, 1) = h(x).$$

(c).

$$\frac{\partial u}{\partial n}(0, y) = 0, \quad \frac{\partial u}{\partial n}(1, y) = 0, \quad u(x, 0) = 0, \quad u(x, 1) = f(x).$$

Problems from textbook:

Ch 12.3: 9, 10, 11, 12.