Homework 4 (MATH 5400-01)   **Name (Print):**

Due date: Friday, Oct. 5, 2012

1. Solve formally by separation of variables:

$$u_{tt} = c^2 u_{xx}, \qquad\qquad\qquad 0 < x < L, t > 0$$

$$u(x,0) = f(x), \quad u_t(x,0) = g(x), \quad 0 \le x \le L$$

$$u(0,t) = 0, \qquad u_x(L,t) = 0, \qquad t \ge 0$$

2. Solve formally by separation of variables:

$$u_{tt} + k\, u_t = c^2 u_{xx} + F(x,t), \qquad 0 < x < L, t > 0$$

$$u(x,0) = 0, \qquad u_t(x,0) = 0, \qquad 0 \le x \le L$$

$$u(0,t) = 0, \qquad u_x(L,t) = 0, \qquad t \ge 0$$

3. Solve this problem:

$$u_{tt} = c^2 u_{xx}, \qquad\qquad\qquad 0 < x < 1, t > 0$$

$$u(x,0) = x + 1, \quad u_t(x,0) = x(1-x), \qquad 0 \le x \le 1$$

$$u(0,t) = 1, \qquad u(1,t) = 2, \qquad\qquad t \ge 0$$

Hint: Introduce $v = u - U$, where $U(x)$ satisfies the boundary conditions. Calculate v by solving its PDE.