McGill University
Math 319B: Partial Differential Equations

Assignment 2: due Friday February 9, 2001

1. Solve the initial value problem

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}, \quad u(x,0) = e^x, \ \frac{\partial u}{\partial t}(x,0) = \sin(x).$$

2. Solve the initial value problem

$$\frac{\partial^2 u}{\partial x^2} - 3\frac{\partial^2 u}{\partial x \partial t} - 4\frac{\partial^2 u}{\partial t^2} = 0, \quad u(x,0) = x^2, \ \frac{\partial u}{\partial t}(x,0) = e^x.$$

3. Bring the PDE

$$\frac{\partial^2 u}{\partial x^2} + 3\frac{\partial^2 u}{\partial y^2} - 2\frac{\partial u}{\partial x} + 24\frac{\partial u}{\partial y} + 5u = 0$$

to the standard form

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + cu = 0$$

by a suitable change of variables.

4. Bring the PDE

$$\frac{\partial^2 u}{\partial x^2} - 4\frac{\partial^2 u}{\partial x \partial y} + 4\frac{\partial^2 u}{\partial y^2} + 2\frac{\partial u}{\partial x} + u = 0$$

to the form

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial u}{\partial y} = 0$$

by a suitable change of variables.

5. Find the general solution of the PDE

$$\frac{\partial^2 u}{\partial x^2} - 4\frac{\partial^2 u}{\partial x \partial y} + 4\frac{\partial u}{\partial y} - u = 0.$$