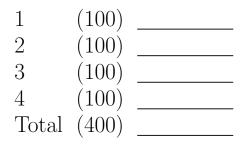
## DEPARTMENT OF MATHEMATICS UNIVERSITY OF KANSAS MATH 647 - Spring 2016 - Sample Midterm

## Your Name: \_\_\_\_\_

On this exam, you may use a calculator and a page of notes.

It is not sufficient to just write down the answers. You must explain how you arrived at your answers and how you know they are correct.



(1) Consider the linear transport equation

$$u_t + (1 + x^2)u_x = 0$$

Find and sketch the characteristic curves, write a formula for the general solutions and find the solution to the initial value problem  $u(x, 0) = 1 - e^{-x^2}$ 

(2) Use D'Alembert's formula to solve the one dimensional wave equation

$$u_{tt} = 4u_{xx},$$

subject to initial conditions

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

(3) Solve problem 4.2.9 from the book by P. Olver.

(4) Solve the non-homogeneous boundary value problem for the one dimensional heat equation on a bar with unit length and c = 1, for the following data:
u(0,t) = 100, u(1,t) = 50, u(x,0) = x.