King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics
Math 513 Assignemt 2 (Term 142)

Name : ..... **ID** #..... Serial #: .....

Question 1: Use the separation of variables to solve the following partial differential equations for $u = u(x,t)$

1. $u_t + u_x = 2u$
2. $u_{tt} - u_{xx} = 0$

Question 2: Consider the function $u = u(r,\theta)$ defined in polar coordinates as

$$u(r,\theta) = (c_1 cos(a\theta) + c_2 sin(a\theta))(c_3 r^a + c_4 r^{-a}),$$

where $c_1, ..., c_4$, and a are some parameters. Show that the function u is a solution of the partial differential equation:

$$r^2 u_{rr} + r u_r + u_{\theta\theta} = 0.$$

Question 3: Solve the following boundary value problems using laplace transform.

1. Problem: Find $u = u(x,t)$ satisfying

$$u_{xx} = u_t, \quad 0 < x < 1, \quad t > 0$$
$$u(0,t) = u(1,t) = 0, \quad t > 0$$
$$u(x,0) = x(1-x)$$

2. Problem: Find $u = u(x,t)$ satisfying

$$u_{xx} = u_{tt}, \quad 0 < x < 1, \quad t > 0$$
$$u(0,t) = u(1,t) = 0, \quad t > 0$$
$$u(x,0) = 0, \quad u_t(x,0) = sin(\pi x)$$