

Dr. Z.'s Calc5 Homework assignment 21

1. Solve the heat equation $u_{xx} = u_t$, $-\infty < x < \infty$, $t > 0$ subject to $u(x, 0) = e^{-|x|}$, $-\infty < x < \infty$.

2. Solve the heat equation $u_{xx} = 4u_t$, $-\infty < x < \infty$, $t > 0$ subject to

$$u(x, 0) = \begin{cases} 0, & \text{if } x < -1; \\ 10, & \text{if } -1 < x < 0; \\ -10, & \text{if } 0 < x < 1; \\ 0, & \text{if } x > 1. \end{cases}$$

3. (OPTIONAL) Solve the partial differential equation

$$u_{xx} + 4u_{yy} = 0, \quad 0 < x < 2, \quad y > 0,$$

subject to the boundary conditions

$$u(0, y) = 0, \quad u(2, y) = e^{-y}, \quad y > 0;$$

$$u_y(x, 0) = 0, \quad 0 < x < 2.$$

4. (OPTIONAL) Use the Fourier Sine Transform to solve the pde

$$u_{xx} + u_{yy} = 0, \quad 0 < x < 2, \quad y > 0$$

subject to the boundary conditions

$$u(0, y) = 0, \quad u(2, y) = ye^{-y}, \quad y > 0;$$

$$u(x, 0) = 0, \quad 0 < x < 2.$$