Dr. Z.'s Calc5 Homework assignment 21

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

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

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

subject to the boundary conditions

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

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

4. Use the Fourier Sine Transform to solve the pde

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

subject to the boundary conditions

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

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