

ME 565 WINTER 2008

Homework Set # 4

due Friday, February 8 (in-class)

due Friday, February 8 (EDGE)

This week's homework assignment will give you more practice with the method of separation of variables, extending applications to Laplace's equation.

1. This first problem is an extension of the example with mixed boundary conditions that I did in class today (Friday February 1).

Solve

$$u_t = 9u_{xx}$$

for a rod of length 4, with boundary conditions,

$$u(0, t) = 0$$

$$u_x(4, t) + u(4, t) = 0$$

and initial condition

$$u(x, 0) = x^3$$

Plot the first 5 terms of your solution.

2. Use the method of separation of variables to solve the modified heat diffusion equation for a rod of length 1.

$$u_t = u_{xx} - u \tag{1}$$

on the interval $0 < x < 1$, $t > 0$ with boundary conditions,

$$u(0, t) = 0 \tag{2}$$

$$u_x(1, t) = 50 \tag{3}$$

and initial condition

$$u(x, 0) = 100x \quad (4)$$

What is the physical interpretation of the extra term? Again, plot the first 5 terms of your solution.

3. Section 12.5 #28, #31

4. Section 12.6 #5, #6