Problem 4

Suppose a laterally insulated metal rod of length $L = 1$ has an initial temperature of $\sin(3\pi x)$ and has its left and right ends fixed at temperatures zero and 10°C. What would be the IBVP that describes this problem?

*Note that the boundary and initial data do not match up in this problem.

Solution

Because this is a rod that's laterally insulated, heat flows in one dimension by conduction. Let the conduction coefficient be denoted by α^2 and let the temperature be denoted by u. The initial boundary value problem is then

$$u_t = \alpha^2 u_{xx}, \quad 0 < x < 1, \ t > 0$$

$$u(0,t) = 0$$
$$u(1,t) = 10$$
$$u(x,0) = \sin(3\pi x).$$