

Homework Assignment # 2

Exercises: Strauss pp 36–37 1, 7 (replacing odd with even), 9, p 40, 2, 3, 5, p 64 1

1. (a) Explain how to solve the Neumann initial-boundary value problem

$$\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}, \quad \frac{\partial u}{\partial x}(t, 0) = 0 = \frac{\partial u}{\partial x}(t, 1), \quad u(0, x) = f(x), \quad \frac{\partial u}{\partial t}(0, x) = g(x),$$

on the interval $0 \leq x \leq 1$. (b) Sketch the graph of the solution at a few representative times when $f(x) = \begin{cases} x - \frac{1}{4}, & \frac{1}{4} \leq x \leq \frac{1}{2}, \\ \frac{3}{4} - x, & \frac{1}{2} \leq x \leq \frac{3}{4} \\ 0, & \text{otherwise,} \end{cases}$ and $g(x) = 0$, and discuss what is happening.

Is the solution periodic in time? If so what is the period? (c) Do the same when $f(x) = 0$ and $g(x) = x$.

Due: Thursday, September 30

Text: Walter A. Strauss, *Partial Differential Equations: an Introduction*, John Wiley & Sons, New York, 1992.