MAT 341: Applied Real Analysis – Spring 2017

HW8 – Comments

Sec. 3.3 – Problem 1: The problem is asking you to find some values of $u(x,t)$ such that

$$\begin{aligned}
&\frac{\partial^2 u}{\partial x^2} = \frac{1}{c^2}\frac{\partial^2 u}{\partial t^2}, \qquad 0 < x < a, \quad t > 0;\\
&u(0,t) = 0, \quad u(a,t) = 0, \quad t > 0;\\
&u(x,0) = f(x), \quad t > 0;\\
&\frac{\partial u}{\partial x}(x,0) = 0, \quad 0 < x < a.
\end{aligned}$$

where $f(x)$ has the following equation:

$$f(x) = \begin{cases} \dfrac{2h}{a}x & \text{if} \quad 0 \le x \le \frac{a}{2} \\ -\dfrac{2h}{a}x + 2h & \text{if} \quad \frac{a}{2} < x \le a. \end{cases}$$

You then need to write a table with the values $u(x,t)$ at the required times, such as $u(0.25a, 0.2a/c)$. The solution $u(x,t)$ is written in Equation 13, but without the function G_e. **Note:** In the textbook, $\overline{f}_o$ means an odd periodic extension of f, while $\overline{G}_e$ means an even periodic extension of G.

Sec. 3.3 – Problem 2: You fix time $t = 0, 0.2a/c, 0.4a/c, 0.8a/c, 1.4a/c$ and you sketch 5 graphs of $u(x,t)$. For example, you need to sketch the graph of $u(x, 0.4a/c)$ as a function of x. You may assume $a = 1$ if it helps. The graphs should look like Figure 3 from Section 3.2.

Sec. 3.3 – Problem 5: The solution $u(x,t)$ verifies the PDE:

$$\begin{aligned}
&\frac{\partial^2 u}{\partial x^2} = \frac{1}{c^2}\frac{\partial^2 u}{\partial t^2}, \qquad 0 < x < a, \quad t > 0;\\
&u(0,t) = 0, \quad u(a,t) = 0, \quad t > 0;\\
&u(x,0) = 0, \qquad 0 < x < a;\\
&\frac{\partial u}{\partial t}(x,0) = \alpha c, \quad 0 < x < a.
\end{aligned}$$

where α is just a constant, unrelated to a.