

Homework 3

1. Find the solution to the heat conduction problem

$$\begin{aligned}u_t &= 100u_{xx}, & 0 < x < 1, & \quad t > 0, \\u(0, t) &= 0, & u(1, t) &= 0, & \quad t > 0, \\u(x, 0) &= \sin(2\pi x) - \sin(5\pi x), & 0 \leq x \leq 1.\end{aligned}$$

2. Find the solution to the heat conduction problem

$$\begin{aligned}u_t &= \frac{1}{4}u_{xx}, & 0 < x < 2, & \quad t > 0, \\u(0, t) &= 0, & u(2, t) &= 0, & \quad t > 0, \\u(x, 0) &= 2 \sin \frac{\pi x}{2} - \sin \pi x + 4 \sin 2\pi x, & 0 \leq x \leq 2.\end{aligned}$$

3. Consider the conduction of heat in a rod 40 cm in length whose ends are maintained at 0° for all $t > 0$. Suppose also that $\alpha = 1$ and that $u(x, 0) = x$ for $0 \leq x < 40$. Find the equation of the temperature at time t and position x on the rod.