

## Sections 10.5 and 10.6

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**Exercise 1.** Consider the conduction of heat in a rod 40 cm in length whose ends are maintained at  $0^\circ\text{C}$  for all  $t$ . Find an expression for the temperature  $u(x, t)$ , if the initial temperature distribution in the rod is the function

$$u(0, x) = \begin{cases} x, & 0 \leq x < 20 \\ 40 - x & 20 < x < 40 \end{cases}$$

Suppose  $\alpha^2 = 2$ .

**Exercise 2.** Consider a bar 30 cm long that is made of a material for which  $\alpha^2 = 3$  and whose ends are insulated, Suppose that the initial temperature is zero except for the interval  $5 < x < 10$ , where the initial temperature is  $25^\circ\text{C}$ .

Find the temperature  $u(x, t)$ .

**Exercise 3.** Let an aluminum rod of length 20 cm be initially at the uniform temperature of  $25^\circ\text{C}$ . Suppose that at time  $t = 0$ , the end  $x = 0$  is cooled to  $10^\circ\text{C}$  while the end  $x = 20$  is heated to  $50^\circ\text{C}$ , and both are thereafter maintained at those temperatures.

Find the temperature distribution in the rod at time  $t$ .