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Assignment	02
Subject	Differential Equation
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Q: Application of partial Differential Eq.

The heat Equation is an important eq which describe the distribution of heat (or variation in temperature) in a given region over time. The equation in one spatial dimension can be stated as follow.

$$\frac{\partial u}{\partial t} = k \frac{\partial^2 u}{\partial x^2}$$

where $u(x, t)$ describe the temperature at a given location x and time t . and k is the thermal diffusivity.

Considered the following.

A one dimensional bar of length L has a uniform initial temperature u_0 . However, cooling discs are located at each end of the bar that describe a temperature

of 0°C . The temperature at any location and time. $u(x, t)$ satisfies (1) with the boundary condition $u(0, t)$ and $u(1, t) = 0$

Verify that

$$u(x, t) = \sum_{n=1}^{\infty} \frac{40/n}{n\pi} (1 - (-1)^n) e^{-\frac{n^2\pi^2}{2}t} \sin(n\pi x)$$

is a solution to the heat equation with the following prescribe boundary $\frac{\partial u}{\partial t} = k \frac{\partial^2 u}{\partial x^2}$

Eq.

$u(0, t) = 0$ prescribe temp 0°C at $x=0$

$u(1, t) = 0$ prescribed temp 0°C at $x=1$