$$\rho C_p \frac{\partial T}{\partial t} = k \nabla^2 T$$

LUMPED $T(t)$

$$\rho V C \frac{dT}{dt} = q_{out}$$

(conv, rad.)
(insulation)
(generation)

$$\rho C_p \frac{\partial T}{\partial t} = k \frac{\partial^2 T}{\partial x^2} \quad (1D)$$

$T(t,x)$ or $T(t,r)$

Cart. $T(t,x)$

Cyl $T(t,r)$

Sph $T(t,\rho)$

$T(t,x,y,z)$
$T(t,r,\theta)$
$T(t,\rho,\varphi,\theta)$

I.C.

① $t=0$
$T=T_i$

B.C.

② $x=0$
$\frac{\partial T}{\partial x}=0$
By sym.

① $x = "L" \to \infty$
Similarity transform
$\eta = \frac{x}{\sqrt{4\alpha t}}$

∞ solid

semi-∞ solid