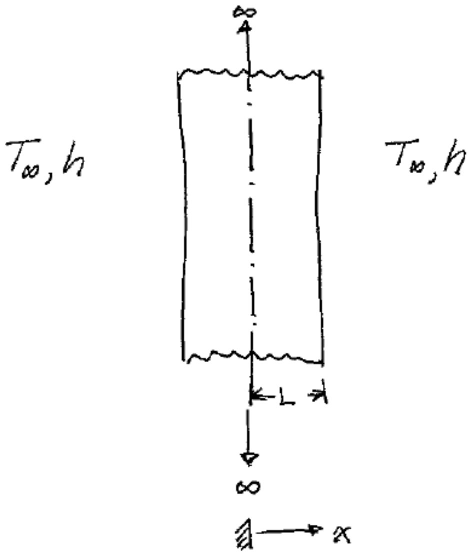
NOTES: Transient conduction

TRANSIENT 1-D CONDUCTION

- TAKE A SLAB ______________ __ ______________
- PUT IT IN A ______________ ______________



CONDUCTION EQN

$$\rho c \frac{\partial T}{\partial t} = \frac{\partial}{\partial x}\left(k \frac{\partial T}{\partial x}\right) + \frac{\partial}{\partial y}\left(k \frac{\partial T}{\partial y}\right) + \frac{\partial}{\partial z}\left(k \frac{\partial T}{\partial z}\right) + \dot{e}_{gen}$$

B.C. # 1: @ $x = L$

B.C. # 2: @ $x = -L$

I.C. $T(x, t=0) =$

SOLVE BY SEPARATION of VARIABLES. USE ______________ ______________ FOR CONSTANTS (FROM B.C.s)

RESULT IN ______________ ______________

$\theta =$

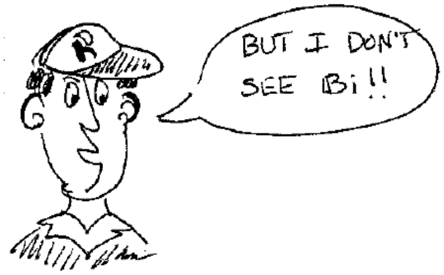
1st TERM APPROX of ∞ SERIES

$\theta(x,t) \equiv$ ______________

WHERE

$Fo = $ ______

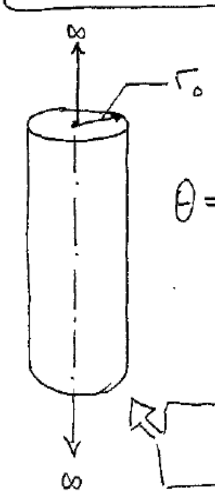
$Bi = $ ______



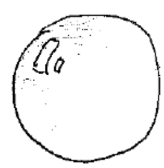
$A_1 = f(\quad)$

$\lambda_1 = f(\quad)$

OTHER GEOMETRIES

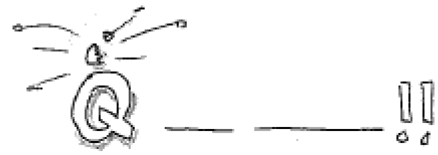


$$\theta = A_1 e^{-\lambda_1^2 Fo} J_0\left(\frac{\lambda r}{r_0}\right)$$



$$\theta = A_1 e^{-\lambda^2 Fo} \left(\frac{\sin\left(\lambda_1 \frac{r}{r_0}\right)}{\lambda_1 \frac{r}{r_0}}\right)$$

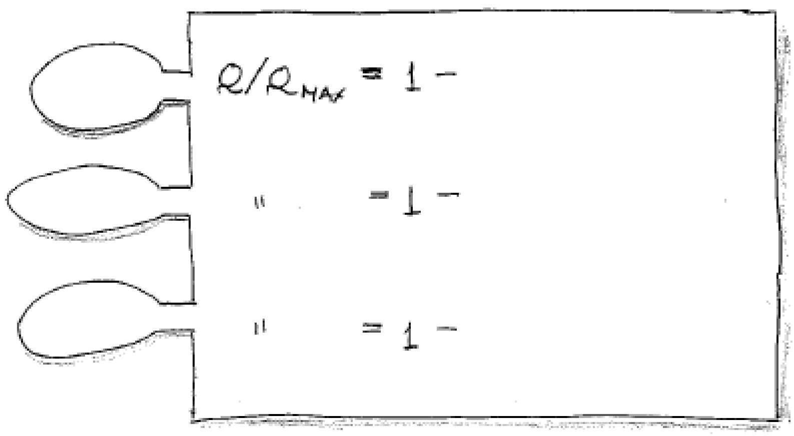
NOTES: Transient conduction



SINCE THIS IS ____________ & WE ARE LOOKING AT

__________ __________ LET'S FIND Q (   )

INSTEAD.



WHERE

$\theta_o = \theta$ AT CENTER POINT =

AND

$Q_{MAX} =$

NOTES: **Transient conduction**