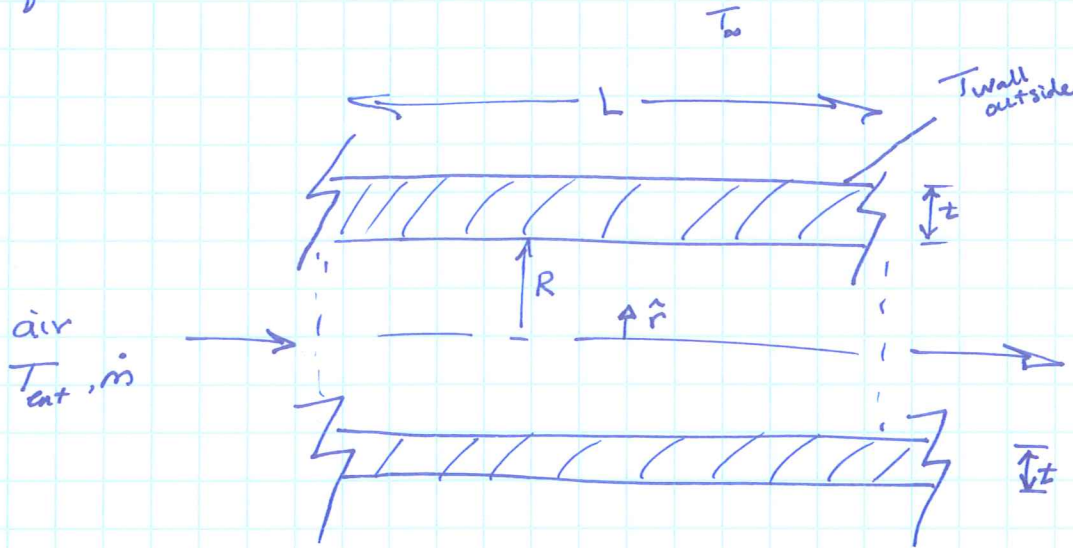


~~$$T(x) = T_{\infty} + [T_{\text{ext}} - T_{\infty}] e^{(h/k)x}$$~~

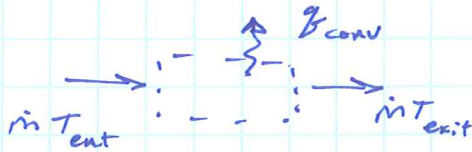
~~$$0 = \frac{h \cdot D}{4k} \frac{dT}{dx}$$~~

$q =$



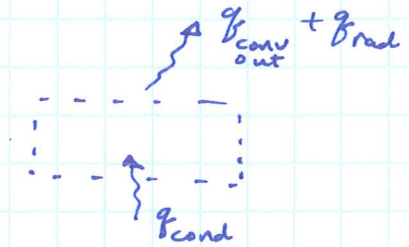
FIND :-  $T_{\text{ext}}$  after some duct length  $L$ .  
 $T_{\text{wall outside}}$  after some length  $L$ .

E balance inside duct:



$$\dot{m} c_p dT = -h A_{\text{in}} (T - T_{\text{wall inside}})$$

E balance outside duct:



$$\dot{q}_{\text{cond}} = \dot{q}_{\text{conv}} + \dot{q}_{\text{rad}}$$

$$-k \frac{\partial T}{\partial r} A = h A (T_{\text{wall outside}} - T_{\infty}) + \sigma \epsilon (T_{\text{wall outside}}^4 - T_{\infty}^4) \cdot A_{\text{out}}$$