

Procedure:

Using steady state differential equation for 1D conduction spherical:

$$\frac{1}{r^2} \frac{d}{dr} \left(r^2 k \frac{dT}{dr} \right) + q = 0$$

we will sub q & k , then
integrate to find 1st constant
integrate again for 2nd constant
to determine heat transfer at
 $r=b$.

Calculations:

equ.: $\frac{1}{r^2} \frac{d}{dr} \left(r^2 k \frac{dT}{dr} \right) + q = 0$ Sub: $\begin{cases} k = k_0 \frac{b^2}{r^2} \\ q = q_0 \frac{b^2}{r^2} \end{cases}$

$$\rightarrow \frac{1}{r^2} \frac{d}{dr} \left(r^2 \left(k_0 \frac{b^2}{r^2} \right) \frac{dT}{dr} \right) + q_0 \frac{b^2}{r^2} = 0$$

$$\rightarrow \frac{1}{r^2} \frac{d}{dr} \left(k_0 b^2 \frac{dT}{dr} \right) + q_0 \frac{b^2}{r^2} = 0 \quad (\div r^2)$$

$$\rightarrow \frac{d}{dr} \left(k_0 b^2 \frac{dT}{dr} \right) + q_0 b^2 = 0$$

$$\rightarrow k_0 b^2 \frac{d}{dr} \left(\frac{dT}{dr} \right) + q_0 b^2 = 0 \quad (\div b^2)$$

$$\rightarrow k_0 \frac{d^2 T}{dr^2} + q_0 = 0 \quad (\div q_0) (\div k_0)$$

$$\rightarrow \frac{d^2 T}{dr^2} = - \frac{q_0}{k_0}$$

integrate (r)

$$\rightarrow \frac{dT}{dr} = - \frac{q_0}{k_0} r + C_1$$