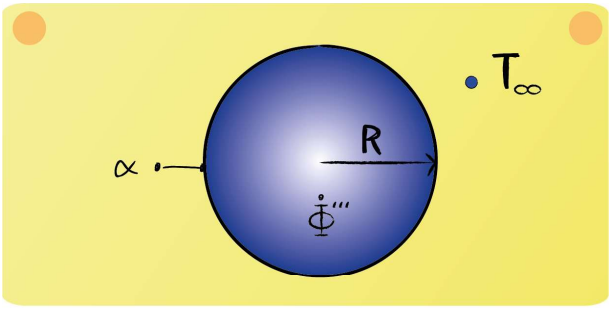
Lecture 8 - Question 8



Specify the energy balance to obtain the surface temperature T_w of the cylinder. Assume steady state conditions.

Energy balance:

$$\dot{\Phi} - \dot{Q}_{r,out} = 0$$

Since the type of heat transfer is steady-state, the sum of the in- and outgoing heat fluxes of the control volume should equal zero.

Heat fluxes:

$$\dot{\Phi} = \dot{\Phi}''' \cdot \tfrac{4}{3} \cdot \pi \cdot R^3$$

$$\dot{Q}_{r,out} \;=\; \alpha \cdot 4 \cdot \pi \cdot R^2 \cdot (T_w - T_\infty)$$