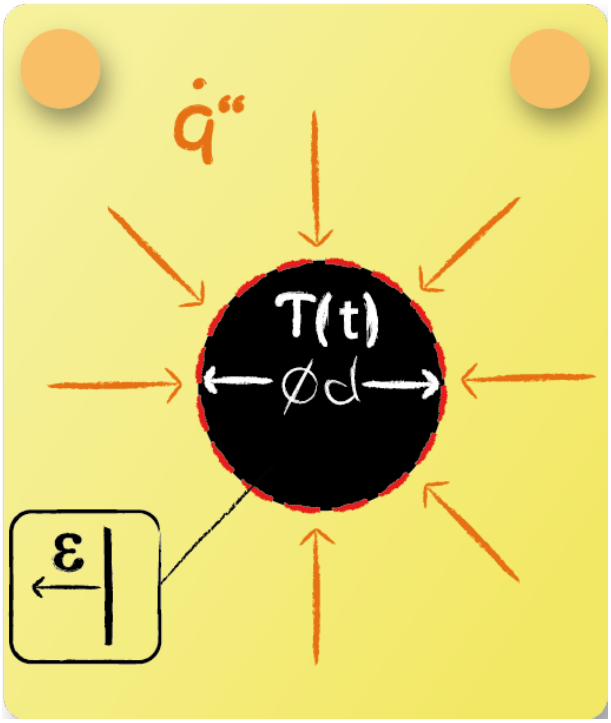
Energy Balance: Task 1



Set up the sphere's transient energy balance for Bi $\ll 1$.

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The condition Bi $\ll 1$ states that thermal resistance at the body's surface is orders of magnitude greater than thermal resistance inside the body. This yields to the assumption of a homogeneous temperature distribution within the sphere. An ingoing heat flux is given by $\dot{q}''$ and ϵ indicating radiative emission as an outgoing heat flux. The temporal change of internal energy is than formulated as:

$$\frac{\partial U}{\partial t} = -\epsilon \pi d^2 \sigma T^4 + \dot{q}'' \pi d^2$$