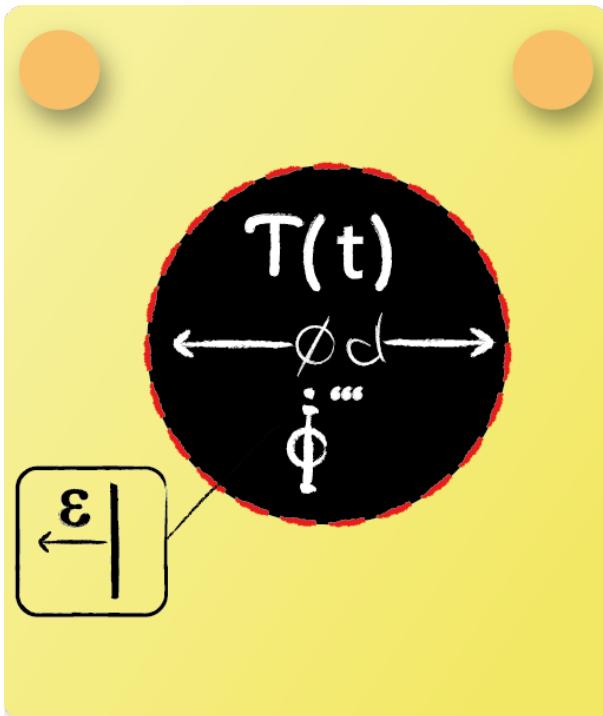


Energy Balance: Task 3



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

1



The condition $\text{Bi} \ll 1$ 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 in the solid. There is a volumetric heat source within the sphere given as $\dot{\phi}'''$ and an outgoing radiative heat flux indicated by ϵ . The temporal change of internal energy is than formulated as:

$$\frac{\partial U}{\partial t} = -\epsilon\pi d^2\sigma T^4 + \frac{\pi d^3}{6}\dot{\phi}'''$$