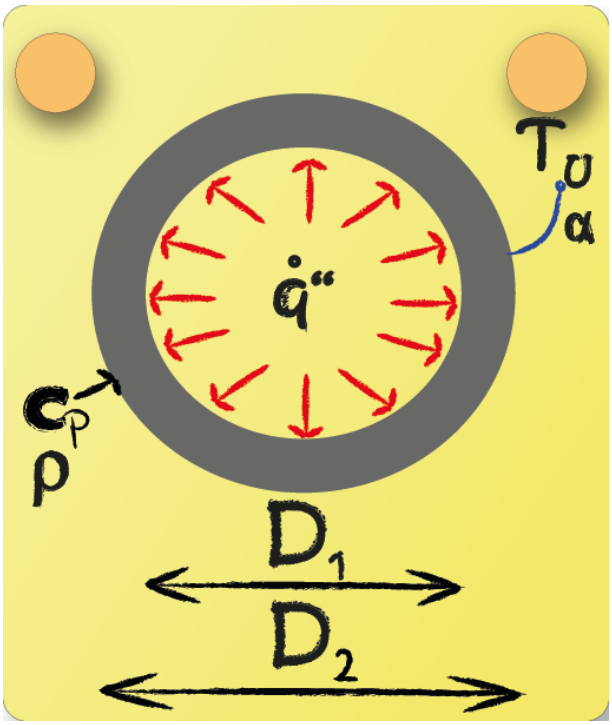
Energy Balance: Task 11



Derive the differential equation for the pipe's time dependent temperature.

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The differential equation is obtained by setting up the instationary energy balance for the pipe as the temporal derivative of internal energy corresponding to ingoing heat flux at the inner wall and a convective heat flux at the outer wall:

$$\rho c_\mathrm{p} \frac{D_2^2 - D_1^2}{4} \frac{\partial T}{\partial t} = D_1 \dot{q}'' - D_2 \alpha (T - T_\mathrm{u})$$