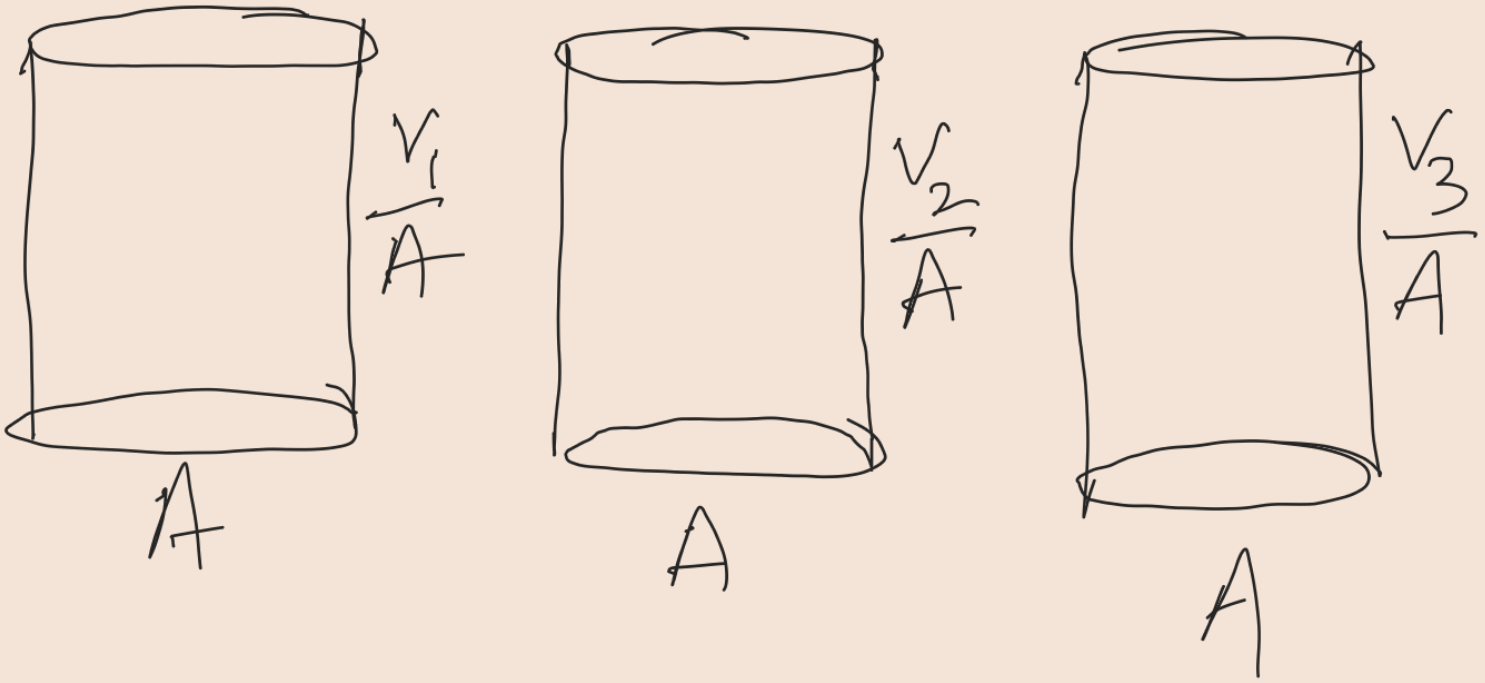


For the first cylinder, the rate of supply $\frac{dQ}{dt}$ must equal rate of heat loss due to radiation.

$$\frac{dQ}{dt} = \sigma \varepsilon \left[2A + \sqrt{\pi}\sqrt{\frac{A}{\pi}}\frac{V_1}{A}\right](T^4 - T_0^4)$$

Also, for second cylinder,

$$\frac{dQ}{dt} = \sigma\varepsilon\left[2A + \sqrt{\frac{A}{\pi}}\frac{V_2}{A}\right]\left[\theta_2^4 - \theta_0^4\right]$$

Dividing, we have

$$\frac{2A + \dfrac{V_1}{\sqrt{\pi A}}}{2A + \dfrac{V_2}{\sqrt{\pi A}}} = \frac{\theta_1^4 - \theta_0^4}{\theta_2^4 - \theta_0^4}$$

$$\frac{1 + \dfrac{V_1}{2\sqrt{\pi}A^{3/2}}}{1 + \dfrac{V_2}{2\sqrt{\pi}A^{3/2}}} = \frac{\left(\dfrac{\theta_1}{\theta_0}\right)^4 - 1}{\left(\dfrac{\theta_2}{\theta_0}\right)^4 - 1}$$

$$\left(\frac{\theta_2}{\theta_0}\right)^4 - 1 + \left(\frac{V_1}{x}\right)\left(\frac{\theta_2}{\theta_0}\right)^4 - \frac{V_1}{x}$$

$$= \left(\frac{\theta_1}{\theta_0}\right)^4 - 1 + \frac{V_2}{x}\left(\frac{\theta_2}{\theta_0}\right)^4 - \left(\frac{V_2}{x}\right)$$

$$\left(\frac{V_1}{x}\right)\left\{\left(\frac{\theta_2}{\theta_0}\right)^4 - 1\right\}$$

$$- \left(\frac{V_2}{x}\right)\left\{\left(\frac{\theta_2}{\theta_0}\right)^4 - 1\right\}$$

$$= \frac{\theta_1^4 - \theta_2^4}{\theta_0^4}$$

Solving the above eqn for $\dot{x}$, we obtain $\frac{dQ}{dt}$, which is rate of heat supplied by heater & then solve for the third heater.

Path finder has assumed that rate of heat dissipation to surroundings is directly proportional to difference of temp, which is fundamentally

incorrect here as that proportionality has been achieved assuming that diff of temp btw body & surroundings is much less than surroundings, which is NOT THE CASE HERE.