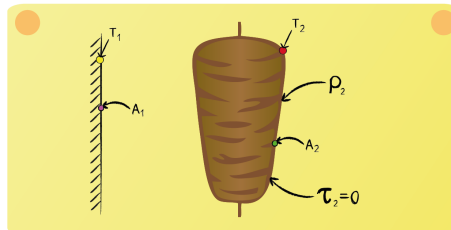


Energy Balance - Radiation - Outer 1

A doner kebab is grilled by means of a radiating electric heater. The grill can be assumed to be a black body and the kebab can be assumed to be a perfect cylindrical grey body, both with a homogeneous surface temperature. Neglect convective heat transfer effect and ambient influence. Setup the outer energy balance of the base.

Hint:

Assume steady-state heat transfer and the view factors to be known.



Energy balance:

$$\dot{Q}_{12} - \dot{Q}_{2\epsilon} - \dot{Q}_{2\rho} = 0$$

Heat fluxes:

$$\dot{Q}_{12} = \Phi_{12} \cdot \sigma \cdot A_1 \cdot T_1^4$$

$$\dot{Q}_{2\epsilon} = \epsilon_2 \cdot \sigma \cdot A_2 \cdot T_2^4$$

$$\dot{Q}_{2\rho} = \rho_2 \cdot \dot{q}'' \cdot L^2$$

Spectral properties:

$$\epsilon_2 = \alpha_2$$

$$\alpha_2 = 1 - \rho_2$$