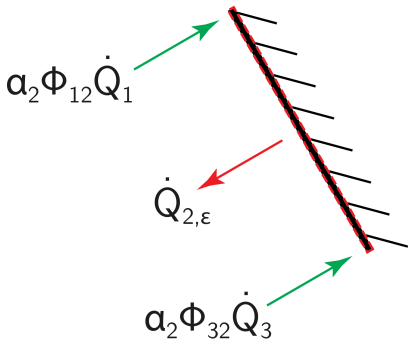
EB - Rad. - Inner 02

Write the inner energy balance for object 2 being in thermal equilibrium. Use view factors and surface brightness whenever possible.



Energy balance:

$$\cancel{\frac{\partial U}{\partial t}}^{0} = \sum \dot{Q}_{\text{in}} - \sum \dot{Q}_{\text{out}}$$

$$0 = \cancel{\alpha_2}^{1}\left(\Phi_{12}\dot{Q}_1 + \Phi_{32}\dot{Q}_3\right) - \dot{Q}_{2,\epsilon}$$

Heat fluxes:

The surface brightnesses of bodies 1 and 3 will be determined in a separate task and can be stated as $\dot{Q}_1$ and $\dot{Q}_3$ respectively.

The emitted radiation of body 2 by use of the emission coefficient, which is equal to one for a black body radiator, and the Stefan-Boltzmann law:

$$\dot{Q}_{2,\epsilon} = \cancel{\epsilon_2}^{1} A_2 \sigma T_2^4$$

Substituting and rewriting:

$$0 = \Phi_{12}\dot{Q}_1 + \Phi_{32}\dot{Q}_3 - A_2\sigma T_2^4$$