Capstone Review

Cases:

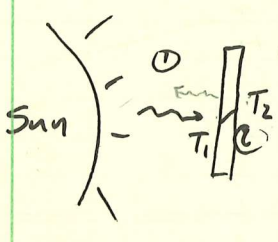
1. Full sun, no internal
2. Deep space, no internal
3. Full sun, internal
4. Deep space, internal

Given:

6061 Al : $C_p = 0.896 \frac{J}{g°}$
$k = 167 \frac{W}{mK}$

=

Case 1



① Radiation from sun to outter surface of OreSat

② Conduction from outter to inner surface

Strategy:
- Find time for T_1 to reach 60°C.
- Find time for T_2 to reach 60°C when $T_1 = 60°C$
- Apply t_2 to Radiation model to find T_1 with t_2.
- Find time for $T_2 = 60°$ when $T_1(t_2)$
- Iterate

From conservation of energy:

$$\dot{E}_{in} - \dot{E}_{out} = mC_p \frac{dT}{dt}$$

$$\frac{\dot{Q}_{sun} - \dot{Q}_{satellite}}{mC_p} = \frac{dT}{dt}$$

$$\frac{dT}{dt} = Q_{solar} + A\sigma\varepsilon F(T^4 - T_{Deep\_space}^4)$$

$$\frac{dT}{dt} = Q_{solar} + \overbrace{A\sigma\varepsilon F}^{C} T^4 - \overbrace{A\sigma\varepsilon F}^{C} T_{Deep\_space}^4$$

$$\frac{dT}{dt} - CT^4 = Q_{solar} - CT_{Deepspace}^4$$