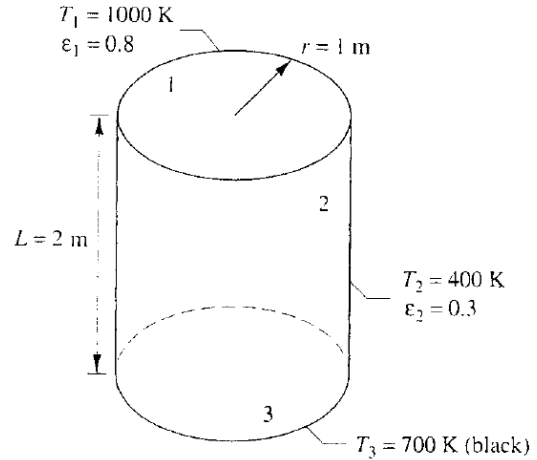**ME 331 Homework Assignment #8**
Due Friday June 2, by 5 pm in MEB main office

1. A cylindrical enclosure has a length and radius of 2.0 m and 1.0 m, respectively, as shown in the figure. The top surface is maintained at 1000 K and has an emissivity of 0.80. The curved surface is maintained at 400 K and has an emissivity of 0.30. The bottom surface approximates a blackbody and is maintained at 700 K. Find the net radiation for each surface.

2. Repeat problem 1, replacing the black surface with a reradiating surface.

$T_1 = 1000$ K
$\varepsilon_1 = 0.8$
$r = 1$ m
$L = 2$ m
$T_2 = 400$ K
$\varepsilon_2 = 0.3$
$T_3 = 700$ K (black)

Surroundings: $T_4 = 300$ K

3. The long channel shown approximates a blackbody. The temperature of surface 1 is maintained at 1200 K, and the temperatures of surfaces 2 and 3 are maintained at 500 K. The channel is open to 300 K surroundings, which may also be approximated as black. Find the radiant heat loss to the surroundings.

Imaginary surface
4
0.5 m 2
$T_2 = 500$ K $T_3 = 500$ K   3 0.5 m
$T_1 = 1200$ K
0.8 m
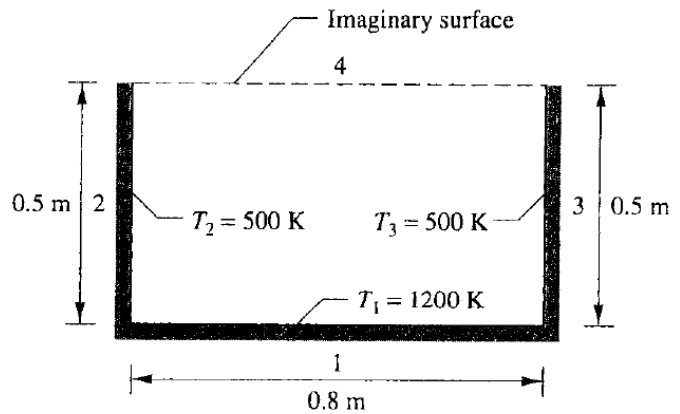
4. A long, bare 20-gage nichrome wire (R = 2.162 Ω/m, d = 8.118x10^{-4} m) runs horizontally through a 280K enclosure containing atmospheric air at 300 K. If the temperature of the wire is not to exceed 1500 K, find the maximum electrical current the wire can carry for the cases of (a) natural convection, and (b) forced convection across the wire at 20 m/s. Find the convection and radiation heat loss from the wire for both cases. Treat the nichrome wire as diffuse, gray with emissivity of 0.30.