Mini-Exam III
CM 3110
12 November 2007

Note:
Significant figures count.
Please box your final answers.
Please be neat.

1. (50 points) For the double-pipe heat exchanger shown below with overall heat transfer coefficient 896 W/m²K and heat transfer area of 34.5 m², what is the total rate of heat transfer? Please give your answer in kW.

[Diagram of heat exchanger with temperatures and heat transfer coefficients]

Heat capacity = 4.102 kJ/kg°C
Flow = 4.9 kg/s

2. (50 points) A steel pipe (thermal conductivity = 26.0 BTU/h ft °F, density = 487.5 lbm/ft³, inner diameter 2.00 in, outer diameter 2.50 in) is insulated with asbestos (thermal conductivity = 0.100 BTU/h ft °F, density = 20.4 lbm/ft³) of thickness 1.00 in. The pipe carries boiling water at 212.00°F, and the temperature of the inside surface of the pipe is 212.00°F. The outside of the steel pipe is measured very accurately to be 211.82°F. What is the temperature at the outer surface of the asbestos insulation?