Problem 1

A thin plate is exposed to solar radiation so that a constant and uniform flux of 1000 W/m$^2$ is absorbed. The back side of the plate is insulated, so that all the energy absorbed is dissipated to an airstream that blows across the plate at 300K, 1 atm and free stream velocity of 5m/s. The plate is 25 cm square. Find: a) the average temperature of the plate and b) the plate temperature at the trailing edge.

Problem 2

Engine oil at 20°C enters a 2 mm tube diameter at a mean velocity of 1.2 m/s. The tube wall temperature is constant at 60°C and the tube is 1 m long. Calculate the exit oil temperature.

Problem 3

A 1 cm horizontal cylinder is maintained at a constant surface temperature of 400K and exposed to air at 300K and pressure of 1 atm. The length of the cylinder is 2 m. Calculate the heat loss by the cylinder.