You are designing a crew cabin for a pressurized lunar rover. The design operating pressure is 8 psi. The required factor of safety for this pressure hull is 2.0. The hull will be built of 6061-T6 aluminum, which has a working yield stress of 37 ksi and a specific gravity of 2.7. Young’s Modulus for 6061-T6 is $10 \times 10^6$ psi.

(1) The pressure vessel is a cylinder 2 m in diameter and 3 m long, with hemispherical end caps attached. Find the minimum required skin thickness for both the cylindrical and the hemispherical portions of the hull.

(2) Due to manufacturing limitations, the entire hull will be built with a skin thickness of 3 mm. Find the margins of safety for the cylinder and the end caps. What is the mass of this hull?

(3) The hull is rigidly attached to the rover understructure at each end of the cylinder. As the rover moves from day to night, the temperature of the hull drops by 75°F. The coefficient of thermal expansion (CTE) for the hull is $13 \times 10^{-6}$ in/in°F. Assume the understructure is perfectly rigid and has a zero CTE. What stress is induced in the cylindrical hull due to this temperature drop?