Physics 1145 Homework for week 14: Fluids

1. A U-shaped tube open to the air at both ends contains water. A quantity of oil of unknown density is slowly poured into the right arm of the tube until the vertical height of the oil column is 20cm. The top of the oil is 8cm higher than the top of the water. Find the density of the oil.

2. A cylinder of radius *R* and height *H* and density ρ_C is floating upright in water and a portion remains above the waterline. The density of water is ρ.
What fraction of the cylinder is below the water line?
Derive an expression for the difference between the pressure at the cylinder's lower (submerged) surface and atmospheric pressure.

3. An object is suspended from a spring scale which reads 8N when the object is in air. The object is then lowered into a beaker of water, and when the object is fully submerged in the water, the scale reads 6N. Find the density of the object.

4. Water flows smoothly through a pipe with various cross-sections. Where the diameter is 3 cm, the speed equals 2m/s.
a) What is the speed where the diameter is equal to 1.5cm?
b) What is the speed where the diameter is equal to 6 cm?

5. Water flowing through a pipe with diameter 2cm can fill a 250 liter bathtub in 5 minutes. Find the speed of the water in the pipe.

6. Water flows through a pipe. At point A, with a diameter of 4cm, the speed of the water is 4m/s and the pressure is 160kPa. At point B, 1.5m higher than point A, the pipe has a diameter of 3 cm. Find the pressure at point B.