# Homework #1

## MEMS 0071 - Introduction to Fluid Mechanics

Assigned: August 30th, 2019
Due: September 6th, 2019

## Problem #1

You are scuba diving in great lakes, which are freshwater lakes ($\rho$=998 [kg/m³]). Determine the pressure at the following depths:
   a) At the maximum depth of Lake Erie, 64 [m]
   b) At the maximum depth of Lake Huron, 229 [m]
   c) At the maximum depth of Lake Ontario, 244 [m]
   d) At the maximum depth of Lake Michigan, 302 [m]
   e) At the maximum depth of Lake Superior, 406 [m]

## Problem #2

You are flying a single-engine, non-pressurized cabin Cessna 172. Determine the atmospheric pressures, in [kPa], at the following elevations above sea level (ASL), assuming the temperature of air does not change with changing elevation
   a) 5,000 [ft] ASL
   b) 10,00 [ft] ASL
   c) 12,000 [ft] ASL

## Problem #3

Imagine you are in a submarine exploring the Mariana Trench, which is 10,994 [m] below sea level.
   a) What is the pressure outside the submarine?
   b) What is the pressure inside the submarine?

## Problem #4

Determine the following material properties:
   a) The specific gravity, SG, or mercury ($\rho$=13,600 [kg/m³])
   b) The specific gravity of air at STP
   c) The specific gravity of castor oil ($\rho$=956.1 [kg/m³])
   d) The specific weight of water at STP
   e) The specific weight of sea water ($\rho$=1,025 [kg/m³])
   f) The specific weight of beer (SG=1.01)
   g) The specific weight of propane (SG=0.495)
   h) The specific weight of glycerin (SG=1.263)
   i) The density of glycerin (SG=1.263)

# Problem #5

Determine the following material properties:
  a) The absolute pressure of a system if the gauge pressure is 200 [kPa]
  b) The gauge pressure of a system with an absolute pressure of 350 [kPa]
  c) The force generated on a 0.5 [m] by 0.75 [m] surface that is exposed to atmospheric pressure on one side and a perfect vacuum on the other