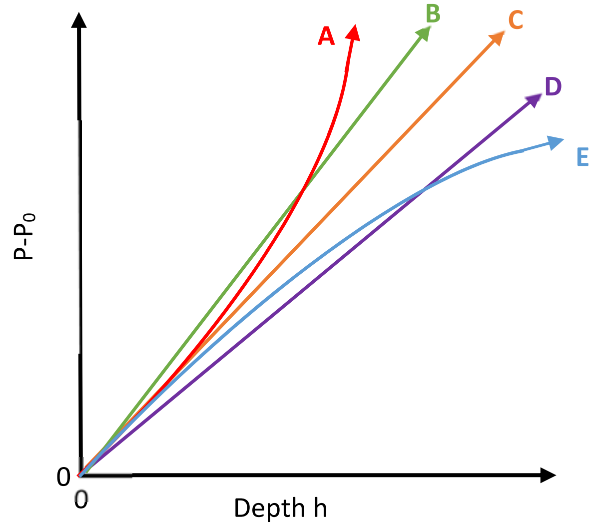
Hydrostatic Equilibrium Worksheet

(to follow the astronomy demonstration video at https://www.youtube.com/watch?v=oRpS2Udx55w)

1) The pressure P at various depths h of a fluid in a graduated cylinder is described by $P = P_0 + \rho g h$ where g is the acceleration of gravity. Thus the differential pressure, the amount above atmospheric pressure P_0 due to the fluid, is described by $P - P_0 = \rho g h$. Indicate which labeled curve or line correctly describes how the differential pressure $P\text{-}P_0$ increases with depth h for a graduated cylinder filled with …



__C__ pure water on Earth

______ pure saltwater ($\rho_{saltwater}$= 1.3) on Earth

______ pure water on a planet with lower gravity

______ water/karo syrup gradient on Earth

Remember the equation of a line has the form:
y = mx + b

2) Two tall graduated cylinders are shown below. The cylinder on the left contains pure water ρ_{water}= 1.0 g/cm^3. The cylinder on the right is half full of Karo syrup ρ_{karo}= 1.33 g/cm^3, water is added, and then the two are partially mixed creating a density gradient from top to bottom.

a) For the cylinder on the left, the pressure is P_α at the depth indicated.

-- Indicate with a labeled arrow (if possible) where the pressure $2P_\alpha$?

-- Indicate with a labeled arrow (if possible) where the density ρ is 1.25 g/cm^3.

b) For the cylinder on the right, the pressure is P_β at the depth indicated.

-- Indicate with a labeled arrow (if possible) where the pressure $2P_\beta$?

-- Indicate with a labeled arrow (if possible) where the density ρ is 1.25 g/cm^3.