Hydrostatic Equilibrium Worksheet

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

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Indicate which labeled curve or line correctly describes the differential pressure how the differential pressure $P-P_0$ increases with depth $h$ for a graduated cylinder filled with ...

_C_ pure water on Earth

_pure saltwater ($\rho_{\text{saltwater}} = 1.3$) on Earth

_ pure water on a planet with lower gravity

_ water/karo syrup gradient on Earth

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2) Two tall graduated cylinders are shown below. The cylinder on the left contains pure water $\rho_{\text{water}} = 1.0$ g/cm$^3$. The cylinder on the right is nearly half full of Karo syrup $\rho_{\text{karo}} = 1.33$ 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 $P_a$ at the depth indicated.
   -- Indicate with a labeled arrow where the pressure $2P_a$?
   -- Indicate with an arrow where the density $\rho$ is 1.25 g/cm$^3$.

b) For the cylinder on the right, the pressure is $P_B$ at the depth indicated.
   -- Indicate with a labeled arrow where the pressure $2P_B$?
   -- Indicate with an arrow where the density $\rho$ is 1.25 g/cm$^3$. 