M E 345

Lecture 37

Today, we will:

- Review the pdf module: **Pressure Measurement**, and do some example problems
- If time, begin the pdf module: Linear Velocity Measurement

Example: Pressure measurement

Given: A U-tube manometer is used as a differential pressure measurement instrument to measure the pressure difference between two tanks. The two tanks are at the same elevation.

(*a*) To do: Calculate the pressure difference $P_{\rm B} - P_{\rm A}$ for the general case in which $\rho_{\rm A}$ is not the same as $\rho_{\rm B}$ (they are different fluids.

(*b*) To do: Simplify for the case in which $\rho_{\rm A} = \rho_{\rm B}$ (they are the same fluid).

Solution:



Example: U-tube manometer

Given: A 4.0-ft tall U-tube manometer is used with water as the manometer fluid to measure a pressure difference in air.

To do: Calculate the maximum pressure difference ΔP that can be measured with this manometer and these two fluids.

Solution:



Example: Density measurement with a U-tube manometer

Given: Brett claims that he can use a U-tube manometer to measure the density of an oil. He sets up the manometer as sketched, with both sides open to the atmosphere, with water (ρ_w) on the left leg, and with both water and oil (ρ_o) on the right leg. He knows the density of the air (ρ_a) and the water, and he carefully measures *H* and *h*.

To do: Calculate the density of the oil in terms of the given variables.

Solution:

