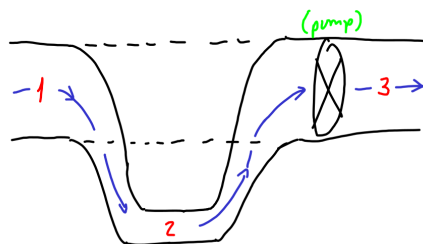


Question 1 'Ranking'

Assuming no dissipation, for each of the following (in)equalities, either choose the correct symbol, or explain why there isn't enough information:

$$v_1 \begin{matrix} \geq \\ \leq \\ = \end{matrix} v_2, \quad v_1 \begin{matrix} \geq \\ \leq \\ = \end{matrix} v_3, \quad v_2 \begin{matrix} \geq \\ \leq \\ = \end{matrix} v_3$$

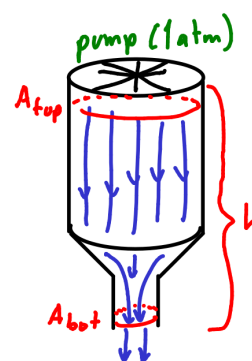
$$P_1 \begin{matrix} \geq \\ \leq \\ = \end{matrix} P_2, \quad P_1 \begin{matrix} \geq \\ \leq \\ = \end{matrix} P_3, \quad P_2 \begin{matrix} \geq \\ \leq \\ = \end{matrix} P_3$$



Question 2 'The Funnel'

A pump is pushing water at a fixed pressure of 1 atm into a frictionless funnel. The bottom of the funnel is open to the atmosphere. The top area of the funnel is $A_{top} = 1 \text{ cm}^2$, and the bottom area is $A_{bottom} = 0.5 \text{ cm}^2$. The height of the water in the funnel $h = 1 \text{ m}$.

What is the speed of the water as it exits the funnel?



Question 3 'The Standpipes'

A frictionless horizontal pipe of constant width is attached to two standpipes, both of which are open to the atmosphere. In each of the following cases, circle the image that best describes what one would see once equilibrium is reached, and then calculate the height difference between the surfaces of water.

Flowing water: Water flows to the right in the horizontal pipe with a flow rate of $I = 1 \text{ m}^3/\text{s}$.

Adding oil: The right standpipe has a 30 cm tall layer of oil ($\rho_{oil} = 0.9\rho_{water}$) added to it.

(There is no flow in the horizontal pipe.)

Note that the height difference should be calculated between the surfaces of water, not the surface of the oil.)

Adding piston: The right standpipe has an airtight piston applying 1.1 atm of pressure.

(There is no flow in the horizontal pipe.)

