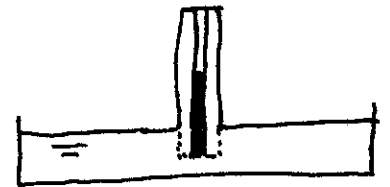


Answer the following questions (10 points each).

1. What is the pressure at the bottom of the UI diving pool? The diving pool is 60 feet wide, 30 feet long, and 15 feet deep.

2. A capillary tube is put into a dish of water. The result is shown below. What force holds the water up the tube? What force keeps it from going further up the tube?



3. Water moves steadily through a nozzle as shown below. Circle the equal sign or inequality sign that best describes the correct relationship.

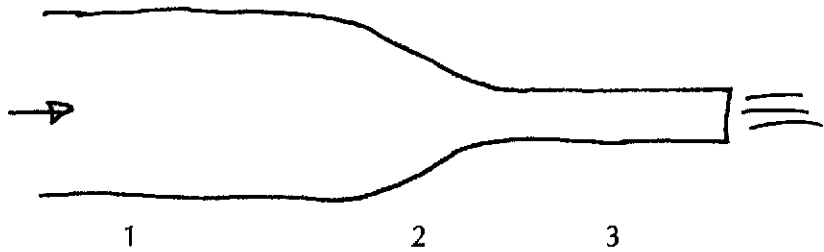
$\rho_{01} > = < \rho_{03}$

$a_{x,local2} > = < 0$

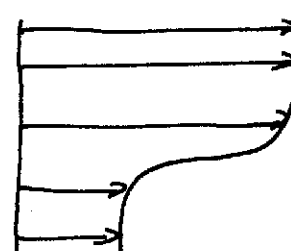
$a_{x,conv2} > = < 0$

$Q_1 > = < Q_3$

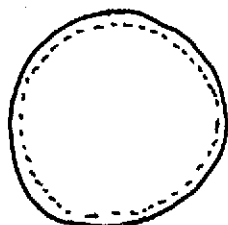
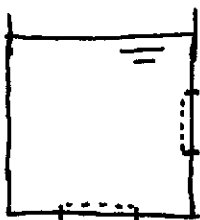
$V_1 > = < V_3$



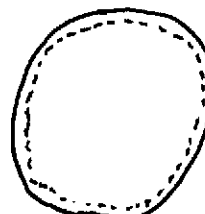
4. The velocity profile on one side of the jet stream is shown below. Mark the point of maximum shear stress. Mark a point of zero shear stress.



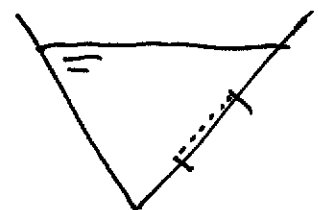
5. Make a clear diagram of the pressure distribution on each surface that is identified by a dashed line below.



AIR FILLED BALLOON



WATER FILLED BALLOON



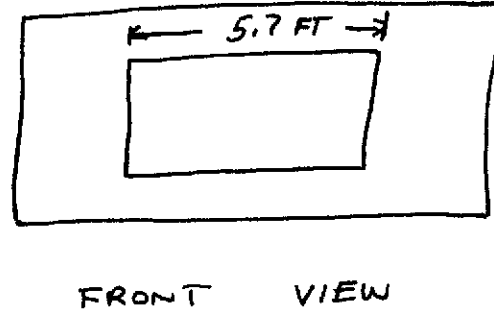
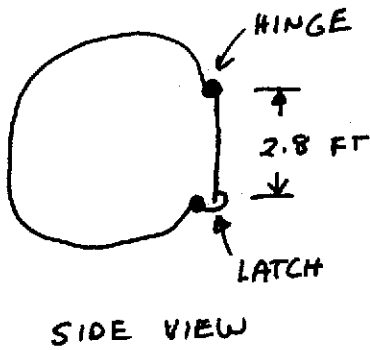
SHOW ALL YOUR WORK ON THE NEXT TWO PROBLEMS

20 pts

6. A space lab has a rectangular exit hatch as shown below. The air pressure inside the lab is 9.7 psia. The pressure outside the space lab is 0.0 psia.

(a) Calculate the force on the hatch. 10 pts

(b) Calculate the force the on the latch that is used to hold the hatch closed. 10 pts



30 pts.

7. A water trough is being filled at a steady rate as shown below. The operator notes that the depth of water in the trough increasing at a rate of  $0.1 \text{ m/s}$  when the water is  $0.7 \text{ m}$  deep. He asks the engineer to determine the flow rate out of the fill pipe.

(a) What principle should be used to solve this problem? 5 pts

(b) Calculate the volume flow rate out of the pipe. 20 pts

(c) Calculate the mass flow rate out of the pipe. 5 pts

