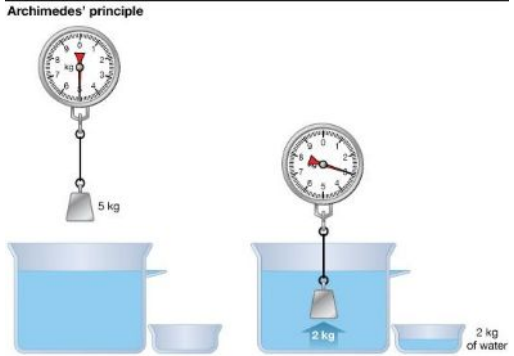
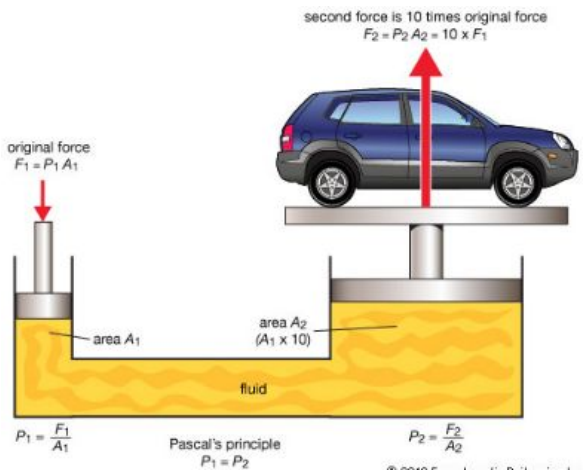
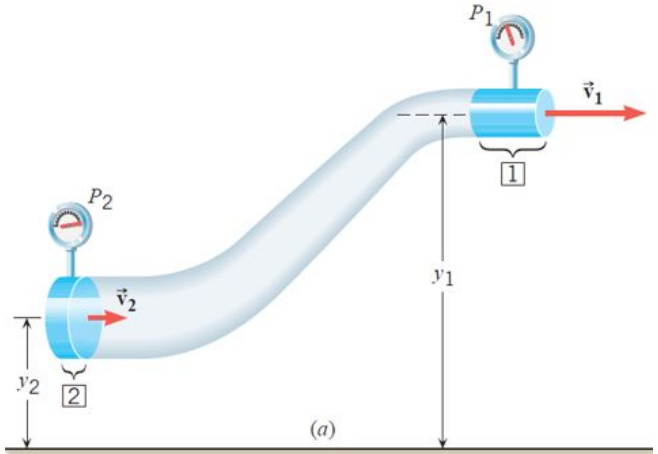
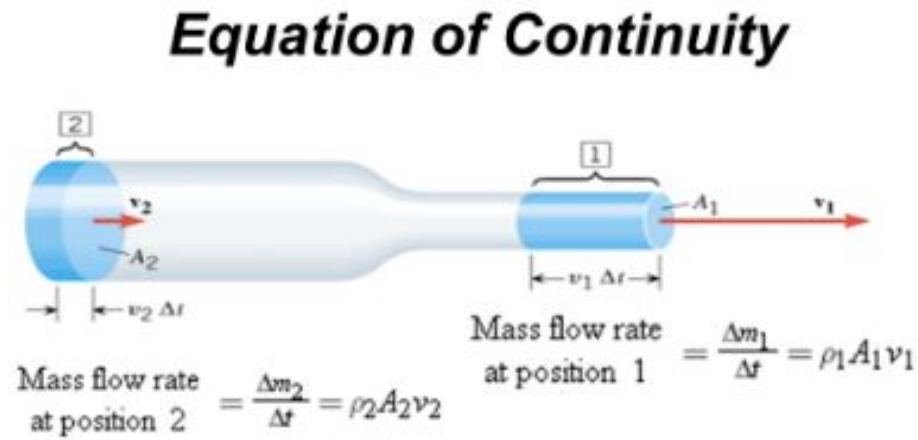
Review

1. Pascal's Principle
2. Archimedes' Principle
3. Equations of Continuity (Mass Flow Rate and Volume Flow Rate)
4. Bernoulli's Equation



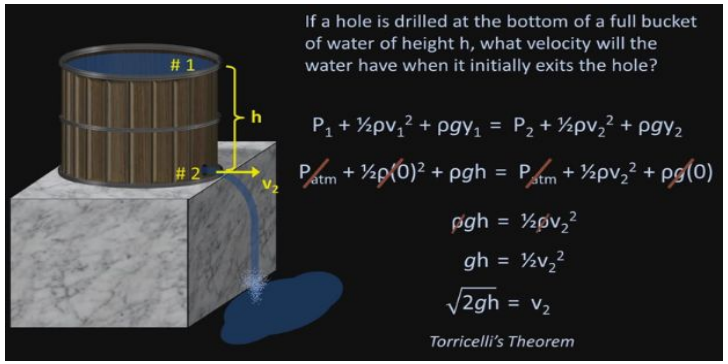




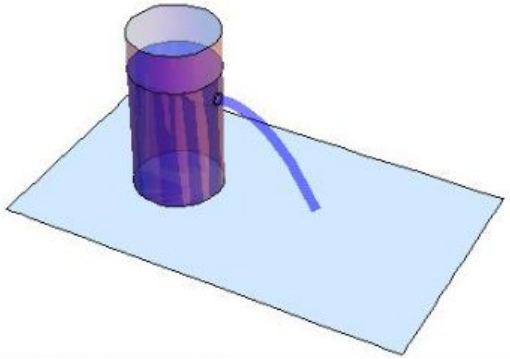


$$\rho_1 A_1 v_1 = \rho_2 A_2 v_2$$

Torricelli's Theorem

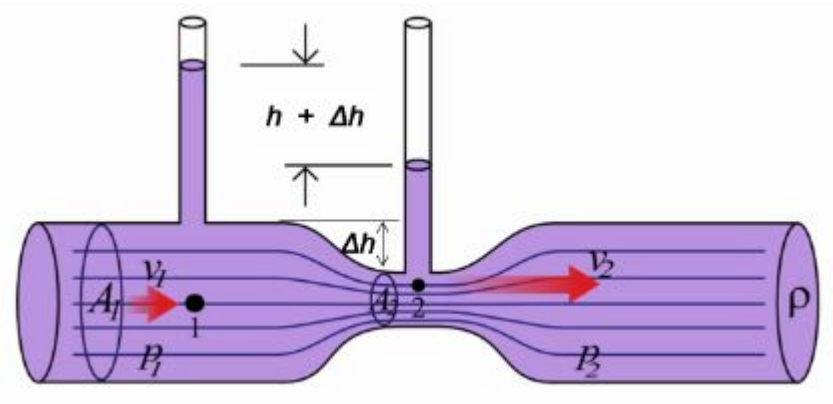


Learning Objective:



Apply Torricelli's equation to solve problem.

Venturi Tube



Look at this short video showing venturimeter:
https://www.youtube.com/watch?v=UNBWI6MV_lY

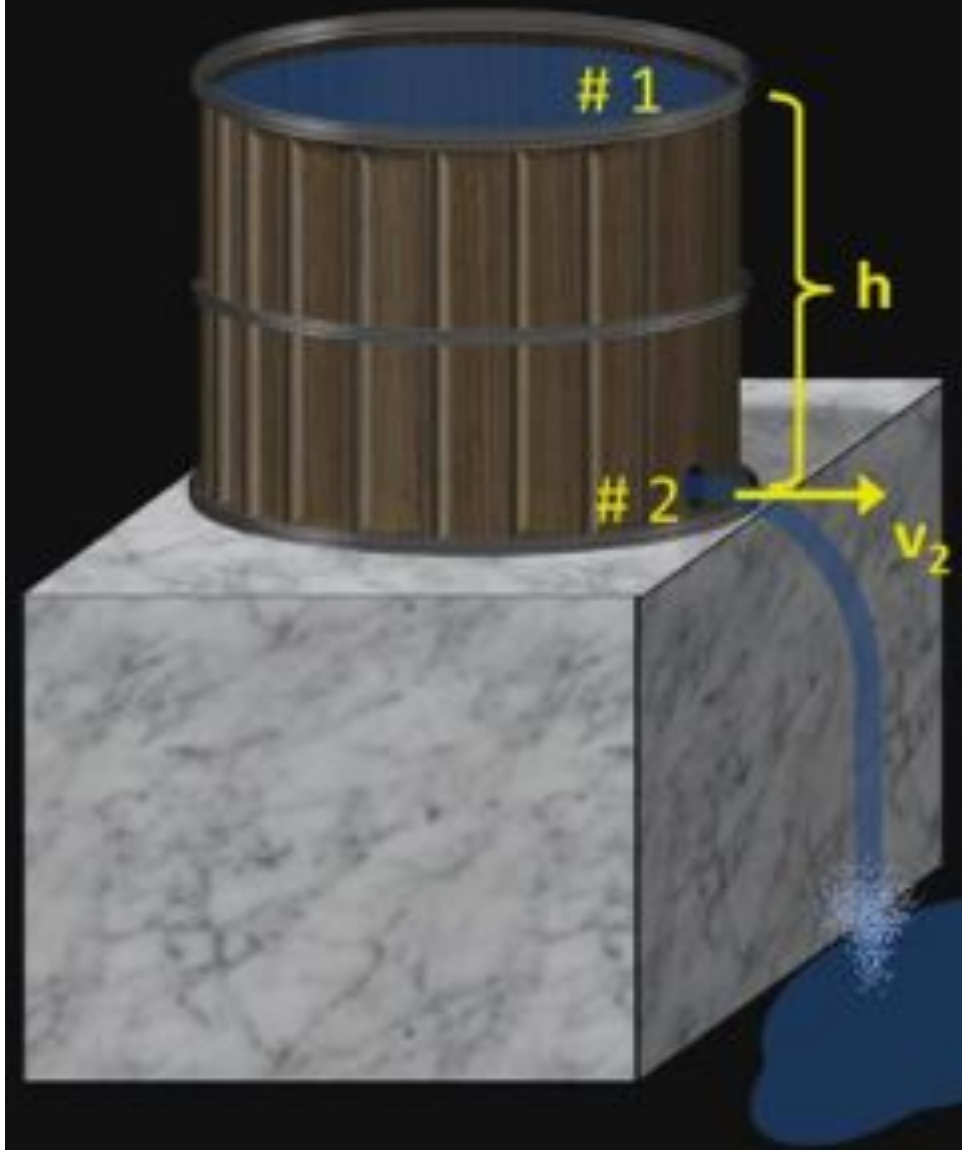
1. **What is a venturimeter?**
2. **How does it work?**
3. **What is the physics principle on how venturimeter works?**

4. Describe the regions in the venturimeter where there is high pressured fluid. low pressure, high velocity, low velocity as well as large and small area.

5. What is the function of the differential pressure sensor or the manometer in the venturimeter?

6. What is a nozzle?

7. Give practical applications or uses of venturimeters.



If a hole is drilled at the bottom of a full bucket of water of height h, what velocity will the water have when it initially exits the hole?

$$P_1 + \tfrac{1}{2}\rho v_1^2 + \rho g y_1 = P_2 + \tfrac{1}{2}\rho v_2^2 + \rho g y_2$$

$$\cancel{P_{atm}} + \tfrac{1}{2}\cancel{\rho}(0)^2 + \rho g h = \cancel{P_{atm}} + \tfrac{1}{2}\rho v_2^2 + \cancel{\rho g}(0)$$

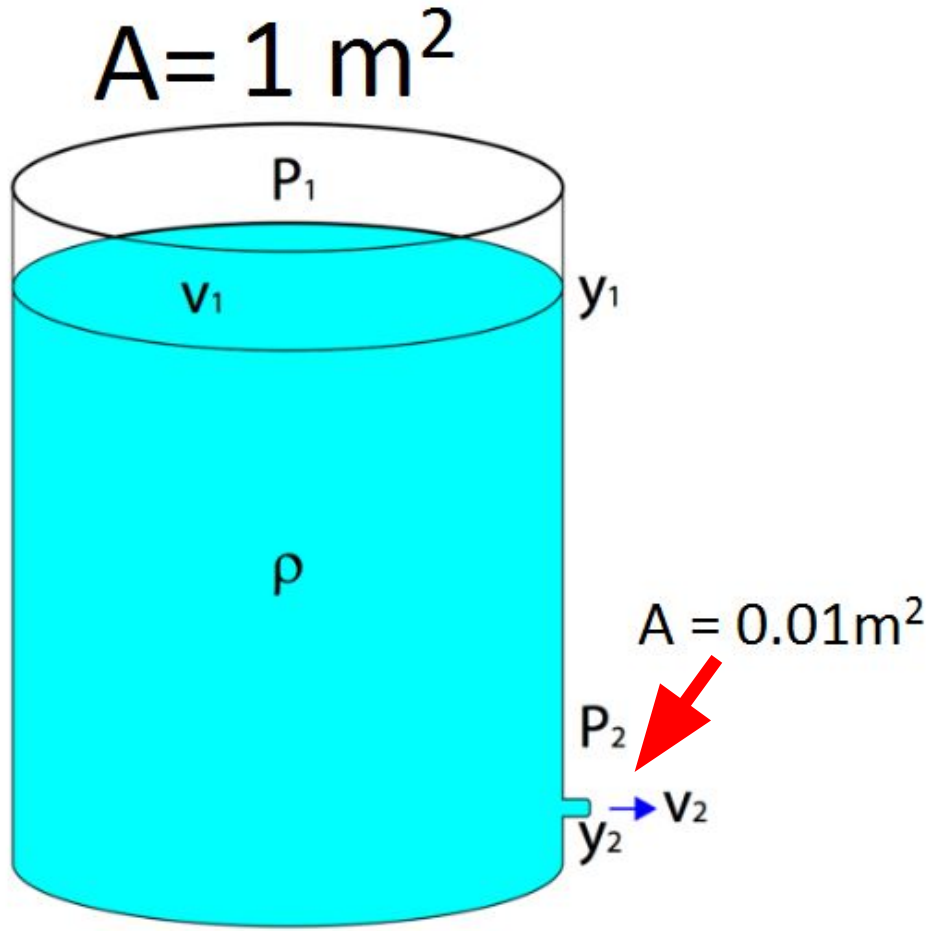
$$\cancel{\rho} g h = \tfrac{1}{2}\cancel{\rho} v_2^2$$

$$g h = \tfrac{1}{2} v_2^2$$

$$\sqrt{2gh} = v_2$$

Torricelli's Theorem

Sample problem: Suppose a tank with cross-sectional area of 1 m^2 contains a spigot at the bottom of the tank with a cross-sectional area of 0.0 spigot is 10 meters above the surface of the tank, calculate the velocity of water leaving the spigot.



The answer is 14 m/s

Continuation of the Sample problem:

Repeat the same problem when the distance of the spigot from the surface of water is:

a. 8 m
b. 5 m
c. 3 m

Q: What can you generalize regarding relationship/ dependence of the water level and the speed of the water from the spigot?

Show this video:

https://math.dartmouth.edu/~calcsite/Animation/TorricelliLaw/