Physics 103 Quiz # 3, Thursday (2/7/2013)
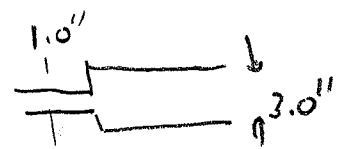Show all work in order to obtain points for problems

Key

Name:_____

1. (2 pts) An ideal fluid flows through a pipe made of two sections with diameters of 1.0 and 3.0 inches, respectively. The speed of the fluid flow through the 3.0-inch section will be what factor times that through the 1.0-inch section?

   a. 6.0
   b. 9.0
   c. 1/3
   d. 1/9

$$A_1 V_1 = A_2 V_2$$
$$V_2 = \frac{A_1}{A_2} V_1$$
$$= \left(\frac{1}{3}\right)^2 V_1 = \frac{1}{9}$$

2. (3 pts) A Boeing-737 airliner has a mass of 20 000 kg. The total area of the wings is 100 m². What must be the pressure difference between the top and bottom of the wings to keep the airplane up?

   a. 1 960 Pa
   b. 3 920 Pa
   c. 7 840 Pa
   d. 15 700 Pa

$$P = \frac{F}{A} = \frac{mg}{A} = \frac{20,000 (9.8)}{100} = 1960 \, Pa$$

3. (5 pts) A fluid is drawn up through a tube as shown below. The atmospheric pressure is the same at both ends. Use Bernoulli's equation to determine the speed of fluid flow out of the tank. If the height difference from the top of the tank to the bottom of the siphon is 1.0 m, then the speed of outflow is:

   a. 1.1 m/s.
   b. 2.2 m/s.
   c. 4.4 m/s.
   d. 8.8 m/s.

1 m

V
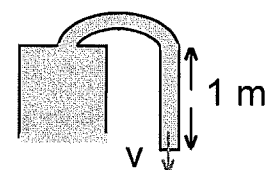
$$P_1 = P_2$$

$$P_1 + \frac{1}{2}\rho V_1^2 + \rho g h_1 = P_2 + \frac{1}{2}\rho V_2^2 + \rho g h_2$$

$$\frac{1}{2}\rho V_1^2 + \rho g h_1 = \frac{1}{2}\rho V_2^2 + \rho g h_2$$

$$\frac{1}{2} V_1^2 + g h_1 = \frac{1}{2} V_2^2 + g h_2$$

$$V_1 = 0 \quad \frac{1}{2} V_2^2 = \frac{1}{2} V_1^2 + g(h_1 - h_2)$$

$$V_2 = \sqrt{2g(h_1 - h_2)} = \sqrt{2(9.8)(1)}$$

$$= 4.4 \, m/s^2$$