

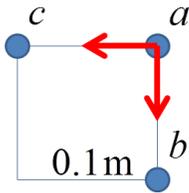
Physics 2314, Homework #10 (due 4/25)

Multiple choice questions

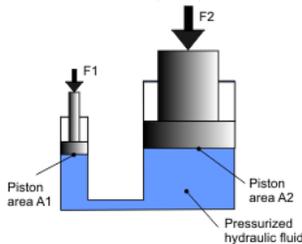
- M1 What is the relation between the speed  $v$  of an object in a circular orbit of radius  $r$  and the escape speed  $v_{\text{esc}}$  determined at the same distance  $r$  from the center of the planet?
- A.  $v_{\text{esc}} = 2v$
  - B.  $v_{\text{esc}} = \sqrt{2}v$
  - C.  $v_{\text{esc}} = v$
  - D.  $v_{\text{esc}} = v/\sqrt{2}$
  - E.  $v_{\text{esc}} = v/2$
- M2 For a black hole, the escape speed at the event horizon is
- A. zero.
  - B. equal to the speed of light  $c$ .
  - C. infinitely large.
- M3 The buoyant force is proportional to
- A. the density of the immersed object.
  - B. the density of the fluid.
  - C. the difference between the densities of the object and the fluid.
- M4 An apple is held completely submerged just below the surface of the water in a container. The apple is then moved to a deeper point in the water. Compared with the force needed to hold the apple just below the surface, what is the force needed to hold the it at the deeper point?
- A. Larger.
  - B. The same.
  - C. Smaller.
  - D. Impossible to determine.

## Problems

- P1 Three particles of equal mass  $m = 1$  kg are located at three corners of a square of side  $d = 0.1$  m as shown below. Find the magnitude and direction of the gravitational force acting on particle  $a$ .



- P2 A space probe is fired as a projectile from the Earth's surface with an initial speed of 20 km/s. What will its speed be when it is very far from the Earth? Ignore atmospheric friction and the rotation of the Earth.
- P3 The small piston of a hydraulic lift has a cross-sectional area of  $3 \text{ cm}^2$ , and its large piston has a cross-sectional area of  $200 \text{ cm}^2$ . What downward force of magnitude  $F_1$  has to be applied to the small piston for the lift to raise a load whose weight is  $F_2 = 15 \text{ kN}$ ?



- P4 A cube of wood having an edge dimension of 0.2 m and a density of  $650 \text{ kg/m}^3$  floats on water. What is the distance from the horizontal top surface of the cube to the water level?