Quiz No. 04 (2014 Summer)

PHYS 203A: College Physics

Date: 2014 Jun 27

(Name) (Signature)

1. (**20 points.**) The weight of an object is the same on two different planets. The radius of planet A is only one-third of planet B. Find the ratio m_A/m_B of the mass of the planets.

2. (**20 points.**) Three particles have their positions on a straight line, far away from any other objects. See Fig. 1. The masses of these particles are $m_1 = 300\,\text{kg}$, $m_2 = 500\,\text{kg}$, and $m_3 = 200\,\text{kg}$. The distances are $r_{12} = 50\,\text{m}$ and $r_{23} = 25\,\text{m}$ Find the magnitude and direction of the net gravitational force acting on each of the three particles.

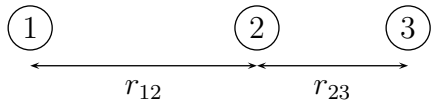

Figure 1: Problem 2

3. (**20 points.**) Your mass is 75 kg, which corresponds to a weight of 735 N. How much will you weigh on a bathroom scale inside an elevator that is

   (a) slowing down at $2\,\text{m/s}^2$ while moving downward?

   (b) speeding up at $2\,\text{m/s}^2$ while moving upward?

4. (**20 points.**) A cup of coffee is on a table in an airplane flying at a constant altitude and a constant velocity. The coefficient of static friction between the cup and the table is 0.31 and the coefficient of kinetic friction between the cup and the table is 0.15. Suddenly, the plane accelerates forward, its altitude remaining constant.

   (a) What is the direction of the friction force with respect to the velocity of the airplane?

   (b) What is the maximum acceleration that the plane can have without the cup sliding backward on the table?

5. (**20 points.**) A trunk with a weight of 220 N rests on the floor. The coefficient of static friction between the trunk and the floor is 0.41, and the coefficient of kinetic friction is 0.32.

   (a) What is the magnitude of the minimum horizontal force with which a person must push on the trunk to start it moving?

   (b) Once the trunk is moving, what magnitude of horizontal force must the person apply to keep it moving with constant velocity?

   (c) If the person continued to push with the force used to start the motion, what would be the magnitude of the trunk's acceleration?