Midterm Exam 02 (2018 Fall)

PHYS 203A-002: College Physics

Date: 2018 Oct 16

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      (Name)   (Signature)

Instructions

1. Seating direction: Please be seated on seats with seat numbers divisible by 3.

2. Total time = 75 minutes.

3. There are 8 questions in this exam.

4. Equation sheet is provided separately.

5. To be considered for partial credit you need to show your work in detail and organize it clearly.

6. A simple calculator (with trigonometric functions) is allowed.

7. Use of mobile phones is strictly prohibited. It should stay out of reach during the exam.

1. (**10 points.**) Mass of Jupiter is 320 times larger than that of Earth. If you are given that the acceleration due to gravity on Jupiter is 2.4 times larger than that on Earth, then what can you conclude about the radius of Jupiter. (Radius of Earth is 6.4×10^6 m.)

2. (**10 points.**) Your mass is $75\,$kg (or $740\,$Newtons). How much will you weigh on a weighing scale (designed to measure the normal force in Newtons) while standing on an incline making an angle of $30°$ with the horizontal.

3. (**10 points.**) A mass m is on a frictionless incline that makes an angle θ with the horizontal. Let $m = 25.0\,\text{kg}$ and $\theta = 30.0°$. Starting from rest how long does the mass
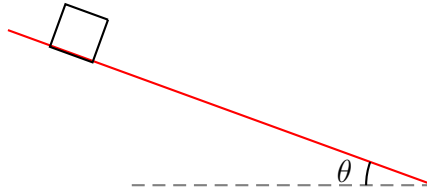

Figure 1: Problem 3

take to travel a distance of $3.00\,\text{m}$ along the incline?

4. (**10 points.**) Three particles have their positions on a straight line, far away from any other objects. See Fig. 2. 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 mass m_1.

Figure 2: Problem 4

5. (**10 points.**) Two objects (50.0 kg and 20.0 kg) are connected by a massless string that passes over a massless, frictionless pulley. The pulley hangs from the ceiling.

(a) Identify and list the forces acting on the 50.0 kg mass.

(b) Find the tension in the string.

6. (**10 points.**) Traveling at a speed of $70.0\,\text{miles/hour}$ ($= 31.3\,\text{m/s}$), the driver of an automobile suddenly locks the wheels by slamming on the brakes. The coefficient of kinetic friction between the tires and the road is 0.50, and the coefficient of static friction between the tires and the road is 0.95. What is the minimum distance in which the car will stop?

7. (**10 points.**) A motorcycle has a constant speed of 20.0 m/s as it passes over the top of a hill whose radius of curvature is 120 m. The mass of the motorcycle and driver is 330 kg. Find the magnitude of the normal force that acts on the cycle.

8. (**10 points.**) A bicyclist travels in a circle of radius $25.0 \, \text{m}$ at a constant speed of $9.00 \, \text{m/s}$. The bicycle-rider mass is $85.0 \, \text{kg}$.

    (a) Calculate the magnitude of the force of friction on the bicycle from the road.

    (b) Calculate the magnitude of the *net* force on the bicycle from the road.