

Name: _____

Phys.115 Exam II
14 June 2004

Please do not turn the page until you are told to do so. When you do so, make sure the you have all three problems on your copy of the test.

In order to get credit on a problem, you must show your work. If you only write down an answer without the work leading up to it, you will get no credit for it, even if it is the right answer.

1. A 9.5-kg monkey is hanging by one arm from a branch and is swinging on a vertical circle. As an approximation, assume a radial distance of 78 cm between the branch and the point where the monkey's mass is located. As the monkey swings through the lowest point on the circle, it has a speed of 2.8 m/s.

(a) (6 points) Please find the magnitude of the centripetal force acting on the monkey.

(b) (7 points) What is the magnitude of the tension in the monkey's arm at the lowest point on the circle?

(c) (7 points) Is the monkey swinging fast enough to make it to the top of the circle? If so, what is the tension in the monkey's arm at the highest point on the circle?

2. A fully-loaded 737 aircraft has a mass of 68,000 kg.

(a) (7 points) Ignoring drag forces, how much work do the engines need to do to achieve a takeoff speed of 250 km/h?

(b) (7 points) What minimum constant force should the engines supply in order to achieve takeoff in a distance of 1.20 km?

(c) (6 points) The 737 is powered by two 117-kN engines. Are they powerful enough to achieve the takeoff as described in part (b)?

3. A 2.0-kg pistol fires a 1.0-g bullet with a muzzle speed of 1000 m/s. The bullet then strikes a 10-kg wooden block resting on a horizontal frictionless surface. The block and the embedded bullet then slide across the surface.



- (a). (5 points) What is the kinetic energy of the bullet as it travels toward the block?
- (b). (5 points) The explosive charge in the pistol acts for 0.001 s. What is the average force exerted on the bullet while it is being fired?
- (c). (5 points) What is the speed of the "bullet + block" system immediately after the bullet is embedded in the block?
- (d). (5 points) If the coefficient of friction between the block and the surface is 0.25, in what distance will the "bullet + block" system stop?