

PHYS 211 Homework Assignment

Chapter 7

Problem 1 A roller coaster car rolls down a frictionless track, reaching a speed of v_0 at the bottom. If you want the car to go twice as fast at the bottom, by what factor must you increase the height of the top of the track? Explain.

Problem 2 A 20 g particle is moving to the left at 30 m/s. How much net work must be done on the particle to cause it to

- (a) move to the right at 30 m/s?
- (b) move up at 30 m/s?

Problem 3 Pat's 10 kg baby brother Paul sits on a mat. Pat pulls the mat across the floor using a rope that is angled 45° above the horizontal. The tension is a constant 30 N and the coefficient of kinetic friction is 0.20. Use work and energy to find Paul's speed after being pulled 3.0 meters.

Problem 4 A 3 kg particle moves in 1 dimension along the x -axis. The net force on the object is given by $F_x = -3\sqrt{x}$ N, where x is in meters. The velocity at $x = 3$ m is 15 m/s.

- (a) What is the speed of the particle at $x = 4$ m?
- (b) Where will the particle be when its velocity is 5 m/s?
- (c) Where will the particle change its direction?

Problem 5 An elevator weighing 50 kN moves up a shaft a distance of 150 m in 15 s. It begins and ends its journey at rest.

- (a) What is the average speed of the elevator?
- (b) What is the average *net* force exerted on the elevator?
- (c) How much work does gravity do during the elevator's motion?
- (d) How much work must the motor do to raise the elevator?
- (e) What average power does the motor produce during this time period?