

Physics 101: Major Concepts in Physics I

Fall 2017

Homework 3 on Chapter 3, Section 5

Go to “Problems” at the end of Chapter 3 beginning on page 83.

(1) 3.54, which stands for the 54th problem in Chapter 3: A baseball is thrown horizontally from a height of 9.60 m above the ground with a speed of 30.0 m/s. Where is the ball after 1.40 s has elapsed?

(2) 3.64: The orange jewelweed (*Impatiens capensis*) has seed pods that explode when lightly touched, launching the seeds as projectiles to disperse them. Suppose a seed is launched at 1.2 m/s from a height of 1.1 m. Assume air resistance is negligible and that the seed follows a clear path to the ground. (a) If the seed is launched horizontally, at what horizontal distance from the seed pod does the seed hit the ground? (b) If the seed is launched at 17 degrees above the horizontal, at what horizontal distance does the seed hit the ground? (c) In the second case, the horizontal distance measured is 0.44 m. Was air resistance negligible?

(3) 3.106: A beanbag is thrown horizontally from a dorm room window a height h above the ground. It hits the ground a horizontal distance h (the same distance h) from the dorm directly below the window from which it was thrown. Ignoring air resistance, find the direction of the beanbag’s velocity just before impact.

Extra Credit Problem 3.108: The invention of the cannon in the fourteenth century made the catapult unnecessary and ended the safety of castle walls. Stone walls were no match for balls shot from cannons. Suppose a cannonball of mass 5.00 kg is launched from a height of 1.10 m, at an angle of elevation of 30.0 degrees with an initial velocity of 50.0 m/s, toward a castle wall of height 30 m and located 215 m away from the cannon. (a) The range of a projectile is defined as the horizontal distance traveled when the projectile returns to its original height. What will be the range reached by the projectile if it is not intercepted by the wall? (b) If the cannonball travels far enough to hit the wall, find the height at which it strikes.

DUE: Wednesday, September 20, 2017 at the beginning of lecture.