

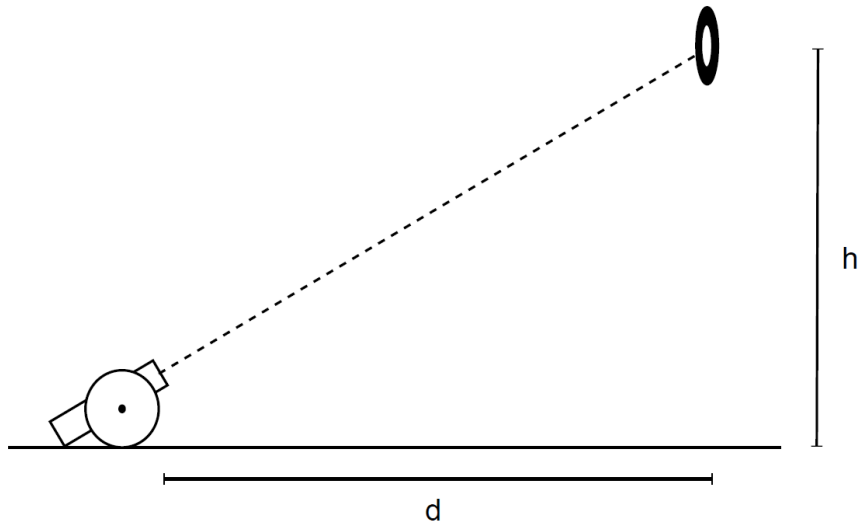
Physics 20 Homework 0

SIMS 2016

Due: Monday, August 15th

Special thanks to Sebastian Fischetti for the image in this problem

1. A cannon is aimed at a target some height h above the ground, a distance d away, as shown. The cannon is fired at the **same instant** (which for convenience we'll take to be $t = 0$) that the target is released and allowed to fall freely under the influence of gravity. The bullet leaves the cannon with speed v .



- (a) Set up a coordinate system for describing the motion of the cannon projectile and the target. You can make any choice for coordinate system that you like, but be consistent once you have chosen one. Also, certain choices of coordinate system may make this problem easier!
- (b) Find the trajectory of the target after it's released in terms of this coordinate system, that is, find the position of the target as a function of time.
- (c) Find the trajectory of the bullet after it's shot, in the same coordinate system.
- (d) Show that the bullet will *always* hit the target, no matter what h , d , or v are.