

Høsten 2016

FYS100 Fysikk

Problems week 36

Have a go at these. And for each, make a little sketch to illustrate the solution.

First some problems from the book:

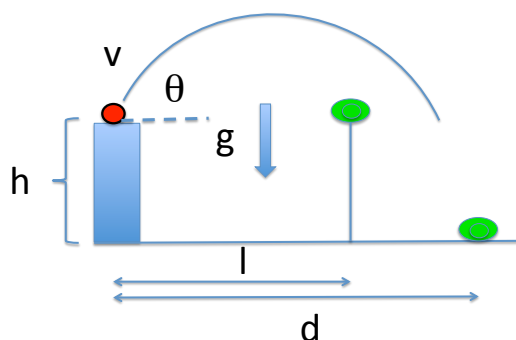
- 4.12, 4.13, 4.22, 4.25.

Additional Problem 1 (Prob. 5, Oblig. 1, 2013):

Wile E. Coyote is keen to catch the Road-Runner (check it on Wikipedia, if you don't know the reference. It won't matter for the following). He hides behind a big rock, and as the Road-Runner zooms past at constant speed $v = 15.0$ m/s, Coyote lights up his ACME rocket pack. After waiting $t_0 = 2.00$ s for the rocket fuse to burn down, he accelerates at a constant rate of $a = 5.00$ m/s², in pursuit of the Road-Runner.

- At what time, with what speed and after what distance does he catch the Road-Runner?
- What if the rocket would stop working after 4 seconds of acceleration and Coyote would continue at constant speed?

Additional Problem 2: (Prob. 1, Hand-in 1, 2015):



You are the chief of the Angry Birds (Google it, if you don't know the reference...it's not important). You can shoot red birds from a catapult, and they will fly as projectiles under the effect of gravity. Gravity points downwards

and has magnitude $g = 9.80 \text{ m/s}^2$. Your goal is to hit some nasty green pigs, who have stolen your Angry Bird Eggs. You are able to adjust the angle θ and speed v of the projectile, as it leaves the catapult. The projectile leaves the catapult at a height h above the ground.

a) First, consider the case when a single green pig is placed on the ground, at a distance d from the foot of the catapult. Find a relation between the angle and speed required to hit it. Remember to draw a sketch of the situation.

b) Next consider the case where there are two green pigs. One on the ground at a distance d as before, the other at a distance $l < d$, and placed on a pole of height h . What should you choose for θ and v in order to hit both pigs with the same red bird? Why must one require $l < d$? Remember to draw a sketch of the situation.