

Classical Mechanics - PHYS 310 - Fall 2013 HW # 1
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Question 1

A long jumper leaves the ground at an angle of 20^0 above the horizontal and at a speed of $11.0m/s$.

- (a) How far does he jump in the horizontal direction?
- (b) What is the maximum height reached. ?

10 points

Question 2

In class, we have solved the problem of a box sliding down on an inclined plane by integrating the Newton's second law. Can you solve this problem using the Kinematic equations. If 'yes', use the Kinematic equation to solve the example problem, for both with friction and without friction.

In particular: solve the following two problems using Kinematic equations.

- (a) A block is sliding down a frictionless plane, that is inclined by an angle θ . What is the acceleration of the block? What is the velocity of the block after it moves from rest a distance x_0 down the plane?
- (b) If the coefficient of static friction between the block and the plane in the previous example is $\mu_s=0.4$, at what angle will the block start sliding if it initially is at rest.
- (c) If the coefficient of kinetic friction is 0.3, find the acceleration of the block when the inclined angle of the plane is 30 degrees.

25 points

Question 3

Can you come up with a problem, where you think you cannot use the Kinematic equation at once throughout the motion?

10 points

Question 4

An object is at rest on a smooth horizontal surface at time $t = 0$. A time dependent force $F = \frac{F_0}{k}t$ is applied in the \hat{x} direction.

- (a) What is the acceleration of the object?
- (b) What is the velocity of the object at time $t = t_0$?
- (c) How long the object has travelled within this time t_0 ?

10 points

Question 5

Open the course webpage and find the embedded interactive simulation in the lecture #3, Are you able to open it? If not, what were the problems?

5 points