

PHY 1321 PHY1331
Principles of Physics I
Dr. Andrzej Czajkowski
Fall 2012

Assignment 1

Released: Fri Sept 14th

Due Friday 21st 10 AM

- 1 By algebraic manipulation of the first two kinematic equations for one-dimensional motion:

$$1)v_f = v_i + at \quad 2)x_f = x_i + v_i t + \frac{1}{2}at^2$$

Obtain the other two kinematic equations: 3) $v_f^2 - v_i^2 = 2a\Delta x$ 4) $x_f = x_i + \frac{1}{2}(v_i + v_f)t$

2. The driver of a car slams on the brakes when he sees a tree blocking the road. The car slows uniformly with an acceleration of -5.60 m/s^2 for 4.20 s , making straight skid marks 62.4 m long ending at the tree. With what speed does the car then strike the tree?

- 3 The height of a helicopter above the ground is given by $h = 3.00t^3$, where h is in meters and t is in seconds. After 2.00 s , the helicopter releases a small mailbag. How long after its release does the mailbag reach the ground?

Assignment 1 Cont.

4 A rocket is fired vertically upward from a well. A catapult gives it initial velocity 80.0 m/s at ground level. Its engines then fire and it accelerates upward at 4.00 m/s^2 until it reaches an altitude of $1\,000 \text{ m}$. At that point its engines fail and the rocket goes into free fall, with an acceleration of -9.80 m/s^2 . (a) How long is the rocket in motion above the ground? (b) What is its maximum altitude? (c) What is its velocity just before it collides with the Earth? (You will need to consider the motion while the engine is operating separate from the free-fall motion)

5 A rock is dropped from rest into a well. (a) The sound of the splash is heard 2.40 s after the rock is released from rest. How far below the top of the well is the surface of the water? The speed of sound in air (at the ambient temperature) is 336 m/s . (b) **What If?** If the travel time for the sound is neglected, what percentage error is introduced when the depth of the well is calculated?