

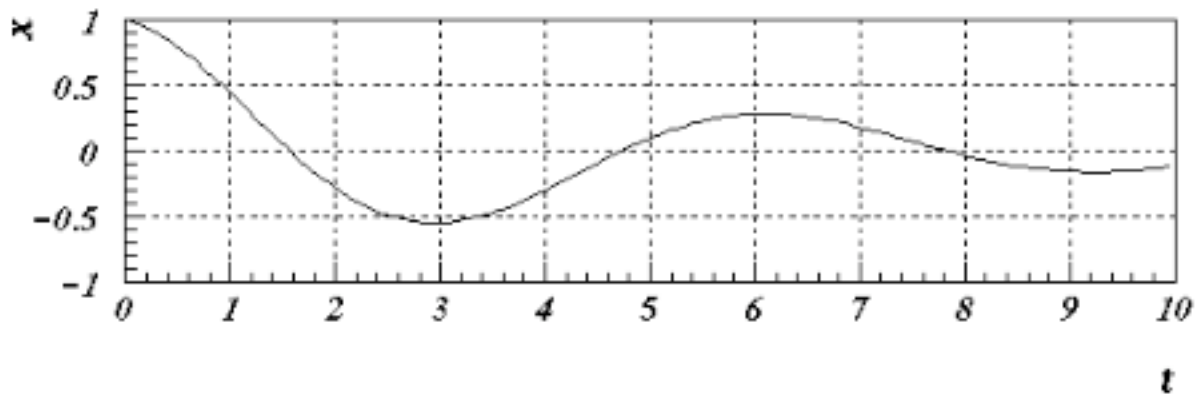
Physics
Problem Set #1

1. Chad scaled the Woodlawn clock tower last week and dropped a watermelon from the top. Given that it took 2 seconds before it impacted the ground, from how far off the ground was it dropped?

2. You are asked to do an experiment to measure g . You set up a device which drops a metal ball from rest from a height of 1.650m. Using an accurate timing device which detects the release of the ball and its landing on the floor, you measure the average time of the falling ball to be 0.585s.

- What do you measure the value of g as?
- Can you give an explanation as to the error from the accepted value of 9.8 meters per square second?

3.



The above plot is of an object's displacement as a function of time. Use it to make a plot of its velocity as a function of time, and acceleration as a function of time.

4. A car increases its velocity from 15 m/s to 25 m/s in the distance of 20 m.

- Find the magnitude of this acceleration
- Find the time it takes for the car to travel this distance

5. A car starts from rest and travels for 10 seconds with a constant acceleration of 3.0 m/s^2 . The driver then applies the brakes causing a constant negative acceleration of -4.0 m/s^2 . Assuming the brakes are applied for 2.0 seconds:

- How fast is the car going at the end of braking?
- How far has the car gone at the end of braking?

6. A ball is thrown straight up in the air and passes a certain window 0.30s after being released. It passes the same window on its way back down 1.50s later. What was the initial velocity of the ball?

7. A model rocket is launched from rest and its engine delivers a constant acceleration of 8.2 meters per square second for 5.0s after which the fuel is used up. Assuming the rocket was launched straight up into the air,

- a. Find the maximum altitude reached by the rocket.
- b. Find the total time the rocket is in flight (assume no air resistance).

8. A jogger with a constant velocity of 4.0 meters/second runs by a stationary dog. After 1 second, the dog decides to chase the jogger. The dog accelerates at 1.5 m/s^2 .

- a. How long does it take the dog to catch the jogger?
- b. How far away from the spot where the dog was sitting has the jogger gone when she is caught by the dog?

Note: assume the jogger is listening to her ipod and doesn't realize the dog chasing her until it's too late. In other words assume constant velocity for the jogger.

9. In a classic "Seinfeld" episode, Jerry races one of his old high school friends. Upon hearing a car backfire, Jerry leaves 0.5 seconds before the other guy. Jerry's maximum acceleration is 2.00 m/s^2 . His friend's is 2.20 m/s^2 .

- a. How long will it take the friend to overtake Jerry?
- b. How far from the start are they when they are even?
- c. What are their respective velocities when they are even?

10. A basketball is dropped from a height of 2.00 meters above the ground. On the first bounce the ball reaches a maximum height of 1.10 meters where it is caught. Find the velocity of the ball:

- a. just before it makes contact with the ground
- b. just after it leaves the ground after the bounce

Also, find the total time from drop to catch (neglecting the time the ball is in contact with the ground)