University of Alabama
Department of Physics and Astronomy

PH 105 LeClair Summer 2012

Problem Set 2

Instructions:

1. Answer all questions below. All questions have equal weight.
2. Show your work for full credit; using the problem template is recommended.
3. All problems are due Thursday 31 May 2012 at the start of lecture.
4. You may collaborate, but everyone must turn in their own work.

Note: you will have time during Thursday's lab period to ask questions about these problems.

1. *HRW 2.25* An electric vehicle starts from rest and accelerates at a rate of $2.0\,\mathrm{m/s^2}$ in a straight line until it reaches a speed of $20\,\mathrm{m/s}$. The vehicle then slows at a constant rate of $1.0\,\mathrm{m/s^2}$ until it stops. (a) How much time elapses from start to stop? (b) How far does the vehicle travel from start to stop?

2. *HRW 2.30* The brakes on your car can slow you at a rate of $5.2\,\mathrm{m/s^2}$. (a) If you are going $137\,\mathrm{km/h}$ and suddenly see a state trooper, what is the minimum time in which you can get your car under the $90\,\mathrm{km/h}$ speed limit? (The answer reveals the futility of braking to keep your high speed from being detected with a radar or laser gun.) (b) Graph x versus t and v versus t for such a slowing.

3. *HRW 2.49* A hot-air balloon is ascending at the rate of $12\,\mathrm{m/s}$ and is $80\,\mathrm{m}$ above the ground when a package is dropped over the side. (a) How long does the package take to reach the ground? (b) With what speed does it hit the ground?

4. A car is traveling at a constant velocity of $18\,\mathrm{m/s}$ and passes a police cruiser. Exactly $2.0\,\mathrm{s}$ after passing, the cruiser begins pursuit, with a constant acceleration of $2.5\,\mathrm{m/s^2}$. How long does it take for the cruiser to overtake the car (from the moment the cop car starts)?