**PHYS 101**

**Homework # 2**
**DUE DATE: September 29, 2009**

Please do not submit copycat answers from the solutions book or some other solution you have in hand. You should at least show your understanding of the problem. Otherwise, this will be considered as cheating. You have to use the problem solving methods that were covered in the lectures.

1) Having taken a nap under a tree only 39.5m from the finish line, Rabbit wakes up to find Turtle 20.0m beyond him, grinding along 1.35 m/s. If the bewildered hare can accelerate (tangent to the path) at 9.0 m/s$^2$ up to his top speed of 12.0 m/s and sustain this speed, will he win? (Make sure to follow the significant digit rules)

2) The depth of a well is such that an object dropped into the well hits the water going far slower than the speed of sound. Show that under these conditions, the depth of the well is given approximately by

$$d=(gt^2/2)(1-gt/v_s)$$

where t is the time when you drop the object until you hear the splash, and $v_s$ is the speed of the sound.

3) Discussion Questions 2.5, 2.10, 2.15, 2.20 (page 61-62) in the text. Chapter 2.

4) Exercise 2-38 (page 65) in the text. Chapter 2.

5) A motorcycle cop, parked at the side of a highway reading a magazine, is passed by a woman in a red Ferrari 308 GTS doing 90.0 km/h. After a few attempts to get his cycle started, the officer roars off 2.00 s later. At what average rate must he accelerate if 110 km/h is his top speed and he is to catch her just at the state line 2.00 km away? (Please consider the number of signifcant figures while presenting your final solution)

6) Problem 2-87 in the text. Chapter 2.

7) Problem 2-92 in the text. Chapter 2.

8) Raindrops drip from a spout at the edge of a roof and fall to the ground. Assume that the drops drip at a steady rate of n drops per second (where n is large) and that the height of the roof is h. a) How many drops are in the air at one instant? b) What is the median height of these drops (i.e. the height above and below which an equal number of drops are found)? c) What is the average of the height of these drops?