PHYSICS 5A – HOMEWORK SET 1

Due in class Wednesday 9/25/02. Ten points per problem. Answers to the odd-numbered exercises are in the back of the book.

Reading: Young and Freedman, Chapter 1 and Chapter 2, sections 2.1-2.4.

1.) Problem 1.4 (Answer: 1.13×10^4 kg/m^3)

2.) Estimate the number of piano tuners in Santa Cruz County (population 250,000). Be very clear in your reasoning.

3.) Problem 1.39 (do part a) only).

4.) Problem 1.60 (Answer: 2.81 km; 62° north of east)

5.) Problem 1.63

6.) Problem 1.72 (do parts a) and b) only; answer to b) is 120°)

7.) Problem 1.74 (Answer: $0.7198\hat{x} - 0.3322\hat{y} + 0.6091\hat{z}$)

8.) Problem 2.4 (Answer: a) 4.4 m/s; b) 0.73 m/s in the $-\hat{x}$ direction)

9.) Problem 2.8; also answer the following question: f) For which point is the instantaneous speed greatest? (I'm not giving the answers for this one.)

10.) Problem 2.9. Your graph need not be that precise.

11.) As a function of time, your x coordinate is given in meters as

$$x(t) = 7 + 10t - t^2.$$

In the time interval between $t = 0$ and $t = 12$ seconds a) What is your minimum speed? b) What is the maximum speed you attain? c) What is your average velocity? d) What is your average speed? e) What is your average acceleration? (selected answers: b) 14 m/s; c) -2 m/s; d) 6.17 m/s)

   12.) A rocket, launched from a height of 10m at t=0, rises into the air at a constant velocity of 7 m/s. A stone thrown at the rocket has a height function (in m) of

$$y(t) = 11t - t^2.$$

a) What is the closest that the stone and the rocket come to each other? b) What is the relative velocity of the stone and rocket at this point of closest approach? Why does this answer make sense when you think about it? (Answer to a): 6m).