

PROBLEM SET #2
Due Friday 25th September 9am

READING: Young and Freedman Chapter 1 §§7-9; Chapter 3 §§1-4.

FORMAT: Please read the instructions on the web page concerning the required format for problem sets.

GENERAL ADVICE: There are two parts to doing a problem – doing the work *and* communicating what you’ve done to your audience (in the present case to the grader). Most readers find it helpful if you solve a problem (or carry it as far as you can) algebraically before you put in the particular numbers relevant to the problem. It’s much easier to follow the logic of an algebraic solution (and not by coincidence, this also helps when you’re checking your work).

- 2-1) Young and Freedman, exercises 1.32, page 30 *and* 1.39, page 31. In this pair of problems you do the same vector addition problem *both* ways: first graphically and then algebraically, using components.
- 2-2) Young and Freedman, exercise 1.51, page 31.
- 2-3) Young and Freedman, exercise 3.8, page 98.
- 2-4) Young and Freedman, exercise 3.15, page 99.
- 2-5) Consider a projectile fired horizontally from a cliff of a given height. With what speed must it be fired so that it makes a 45° angle with the ground when it hits?
- 2-6) Young and Freedman, exercise 3.28, page 100.
- 2-7) The second hand on a *big* clock is 1 meter long. Take the y-axis to be in the direction of 12 o’clock and the x-axis to be in the direction of 3 o’clock.
 - a) Calculate the *instantaneous* velocity and acceleration of the second hand at i) 12:00:00, ii) 12:00:10, iii) 12:00:15, iv) 12:00:30 and v) 12:01:00.
 - b) Calculate the *average* velocity and acceleration of the second hand between 12:00:00 and i) 12:00:10, ii) 12:00:15, iii) 12:00:30 and iv) 12:01:00.
- 2-8) Young and Freedman, exercise 3.35, page 100.
- 2-9) (20 points) Use the data taken in class to determine the acceleration of gravity. Choose one of the five trials shown at <http://web.mit.edu/8.011/www/photos.shtml> and say which one you are using. The spacing between the bars is 0.25 meter. The strobe is flashing 16.7 times per second. *Suggestion: Make a table. Make the first entry time, the second position, the third displacement, the fourth average velocity, the fifth change in velocity and the sixth average acceleration. When you start, leave a blank space between time entries – you may want to use it later.* You are free to choose your coordinate system – in this case the “zero” of position and the “zero” of time.