

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Physics

Physics 8.01

Spring 2005

PROBLEM SET 2

Friday, February 4, 2005

Due Date: Thursday, February 10, 2005, 3:00 p.m.

Reading Assignment: Young and Freedman, finish Chapters 1 and 2, read Chapter 3; Busza, Cartwright, and Guth: finish Chapter 1.

Topics for the week: Acceleration, problems with constant acceleration, vectors (including dot product, but not cross product), motion in 2 and 3 dimensions, projectile motion, uniform circular motion, non-uniform circular motion, relative velocity.

Instructions:

Note that the problems in the 8.01 Study Guide (SG) by Busza, Cartwright, and Guth come in three types: Problems marked “(S)” are worked examples, with full solutions contained later in the same chapter; problems marked “(H)” have hints (just after the worked solutions) to help you if you are stuck; and problems without designation have answers (printed just after the hints, still in the same chapter).

If a problem is marked **DO**, you should write a solution to hand in to be graded. The graders will read your answers to one or two questions on each problem set, and they will check whether the other problems have at least been handed in. Problems marked **STUDY** need not be handed in, but you should study the worked solution so that you know how to solve such a problem even while sleeping. The quiz on this material, to be given at 10:05 am on Friday, February 11, will include at least one problem that is at most a slight modification of one of the problems (**DO** or **STUDY**) on this problem set.

Your written solutions are due by 3:00 pm in room 4-339B on Thursday, February 10. Please indicate the number, instructor, and time of your recitation section, and be sure to submit your paper to the correct bin. Solutions will be made available on the 8.01 website shortly afterward, so that you will be able to use them in studying for the quiz. Since the answers to most problems have been given, your homework grade will be determined by the clarity and quality of your written solution.

Remember: *Trying to learn physics without doing problems is like trying to learn to play the violin by listening to lectures.*

Velocity and acceleration in one dimension:

- 1) **DO:** SG:1A.5 (H) Velocity and acceleration in one dimension
- 2) **DO:** SG:1A.6 Interpreting a graph of v vs. t
- 3) **STUDY:** SG:1A.9 (S) Vertical trajectories on an exotic planet
- 4) **DO:** Y&F:2.19 Graphing the motion of a spider
- 5) **DO:** Y&F:2.27 Acceleration and braking of the Ford Aspire

Using vectors:

- 6) **DO:** SG:1B.2 (H) Using vectors to trace two couples and a dog
- 7) **DO:** Y&F:1.52 Finding angles from vectors

Velocity and acceleration as vectors:

- 8) **DO:** SG:1C.3 (H) The trajectory of a kicked soccer ball
- 9) **DO:** Y&F:2.14 Tracking a suspected UFO
- 10) **DO:** Y&F:3.12 A daring jump
- 11) **DO:** Y&F:3.24 The trajectory of water from a fire hose

Circular motion:

- 12) **DO:** SG:1D.3 Centripetal acceleration of geosynchronous satellites
- 13) **DO:** Y&F:3.29 Acceleration of objects on the Earth's surface

Frames of reference and relative velocity:

- 14) **STUDY:** SG:1E.2 (S) Flying through a windy sky
- 15) **DO:** Y&F:3.39 A canoe on a moving river