PHYS 2022 - Homework 1
Due Wednesday, January 27, 2010
You can either give it to me at the beginning of the class or place it in my mailbox at the secretariat.

Reading: Young and Freedman 3.1-3.4, 9.1-9.3.

1. Y&F 3.3. A web page designer creates an animation in which a dot on a computer screen has a position of $r = [4.0 \text{ cm} + (2.5 \text{ cm/s}^2)t^2] \, i + (5.0 \text{ cm/s}) \, t \, j$. (The quantities in **bold** designate vectors.) (a) Find the magnitude an direction of the dot's average velocity between $t=0$ and $t=2.0$ s. (b) Find the magnitude and direction of the instantaneous velocity at $t=0$, $t=1.0$ s, and $t=2.0$ s. (c) Sketch the dot's trajectory from $t=0$ to $t=2.0$ s, and show the velocities calculated in part (b).

2. Y&F 3.8.

   3.8. A particle moves along a path as shown in Fig. 3.38. Between points B and D, the path is a straight line. Sketch the acceleration vectors at A, C, and E in the cases in which (a) the particle moves with a constant speed; (b) the particle moves with a steadily increasing speed; (c) the particle moves with a steadily decreasing speed.

   Figure 3.38 Exercise 3.8.
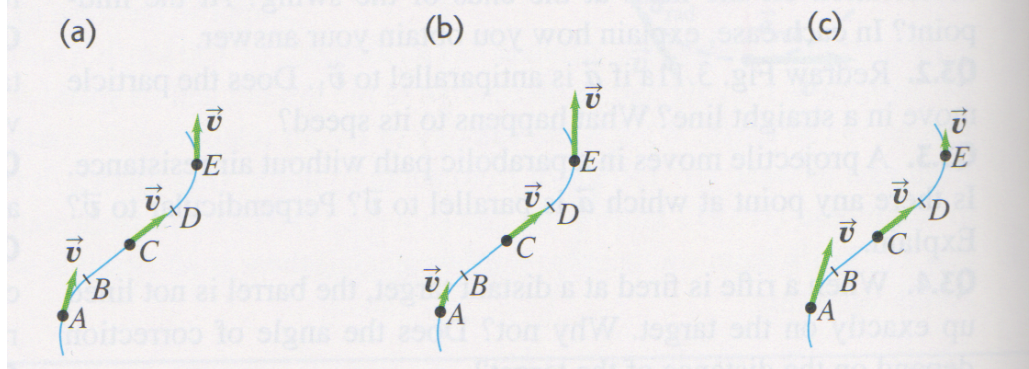
3. Radar represents the coordinates of a flying plane by the distance to the plane and the angle that the direction from the radar to the plane makes with the geographical North. At some moment in time, the plane's position was given by coordinates: angle $\alpha_1 = 44°$, distance $R_1 = 100$ km. After 5 seconds, the coordinates were: angle $\alpha_2 = 46°$, distance $R_2 = 100$ km. A) Using Cartesian coordinates with a y-axis pointing in the North direction and the radar at the origin, sketch the positions of the plane in both instances. B) Determine the absolute value and the direction of its velocity. Assume that the plane is moving along a strait line. The angle α is measured clockwise.