Your Name: _____

Teammates: _____

Physics 8, Fall 2023, Worksheet #2.

Upload PDF (smartphone scan or tablet edit) to Canvas at end of class on Wed, Sep 6, 2023.

Problems marked with (*) must include your own drawing or graph representing the problem and at least one complete sentence describing your reasoning.

Discuss each problem with your teammates (usually groups of 3), then write up your own solution. Be sure to compare final results with your teammates, as a way to catch mistakes. It can also be very interesting when you and a teammate use different methods to arrive at a result. Do not hesitate to ask for help from other students or from the instructors — but don't just copy down other people's results!

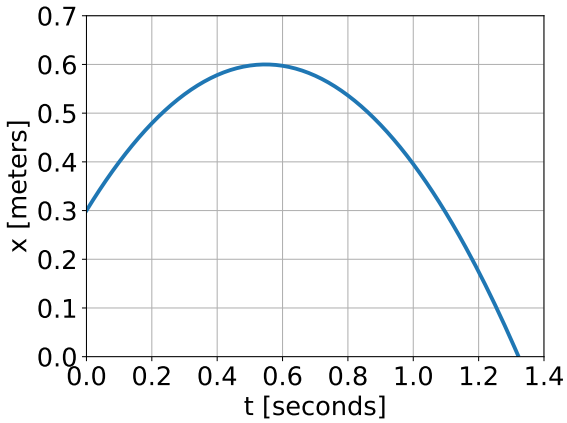
Optional/XC hands-on activity: Dr Batkie will set up one copy of an optional activity, that involves your walking in such a way that the graph of your motion produced by the computer's range-finder mimics a desired graph. Details will be written on the board. If you do this, write it up on the back page of your worksheet or on a blank sheet of paper.

1. If the x component of an object's initial position is $x_i = +6.57\,\mathrm{m}$ and the x component of its final position is $x_f = +4.23\,\mathrm{m}$, what is the x component of its displacement? Remember to label your answer with the proper units (meters).

2*. You walk 1.25 km from home to a restaurant in 20 minutes, stay there for an hour, and then walk back home, taking another 20 minutes. (a) What is the total elapsed time for the trip? (b) What is the distance traveled? (c) What is the displacement? (d) What is your average speed for the trip? (e) What is your average velocity for the trip?

3*. You drive an old car on a straight, level highway at 45.0 miles/hour for 10.0 miles, and then the car stalls. You leave the car and, continuing in the direction in which you were driving, walk to a friend's house 2.0 miles away, arriving 30 min after you begin walking. What is your average speed during the whole trip?

4. The figure below shows the x coordinate as a function of time for a moving object. What is the object's x coordinate (a) at $t = 0$? (b) at $t = 0.55\,\mathrm{s}$? (c) at $t = 1.3\,\mathrm{s}$? What is the object's displacement (d) between $t = 0$ and $t = 0.55\,\mathrm{s}$? (e) between $t = 0.55\,\mathrm{s}$ and $t = 1.3\,\mathrm{s}$? (f) between $t = 0$ and $t = 1.3\,\mathrm{s}$? What is the distance traveled by the object (g) between $t = 0$ and $t = 0.55\,\mathrm{s}$? (h) between $t = 0.55\,\mathrm{s}$ and $t = 1.3\,\mathrm{s}$? (i) between $t = 0$ and $t = 1.3\,\mathrm{s}$?



5*. For the motion represented in the figure above, calculate (a) the object's average velocity between $t = 0$ and $t = 1.3\,\mathrm{s}$, (b) its average speed during this same time interval. (c) Why is the answer to (a) different from the answer to (b)? [Next page is blank for work space.]

6. (Note that in this problem the x axis points *upward*, as is customary for projectile-motion problems in the early chapters of Mazur's textbook.) The height x above the ground for a vertically launched projectile is given by $x(t) = pt - qt^2$, with $p = 42\,\mathrm{m/s}$ and $q = 4.9\,\mathrm{m/s^2}$. (a) At what instant(s) is the projectile at a height of 20 m? (b) What is the meaning of the two solutions to the quadratic expression for $x(t)$ in part (a)? (If you're puzzled by this question, try graphing $x(t)$.) (c) Sketch a graph of the x component of the projectile's velocity as a function of time. (Hint: derivative.)

***** Please check in with one of the instructors before you leave, so that we can give you some quick feedback on your work and get your impressions of the appropriateness of today's assignment. *****