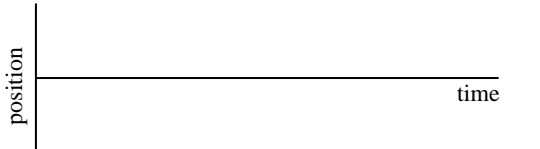



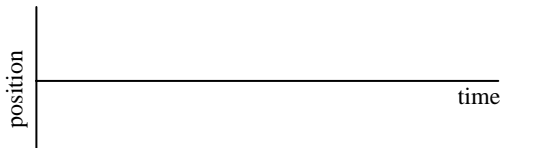


Indoor Activity: Range Finder

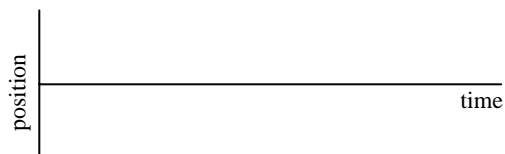
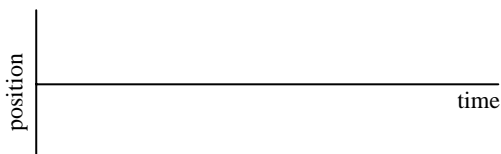
Objective: to measure and understand the fundamental kinematic properties of instantaneous speed, instantaneous velocity, instantaneous acceleration, position, and the interrelations of all these concepts

Procedure: find a partner and a computer; you and your partner may have to share the computer with other groups. This is Ok, as you have to think and write between exercises. Your instructor will demonstrate how to use the range finder. PLEASE USE PENCIL HERE AND ALWAYS.

To begin with, complete each of the exercises below and draw what the range finder displays when it measures your motion. Note that positive values are above the horizontal axis, and negative values are below. Do not draw in any measurements taken before or after the exercise (for instance, if you hit 'collect' then start walking after that, don't include the period where you are stopped.)



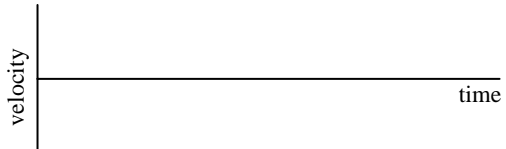
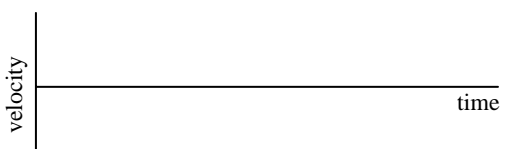
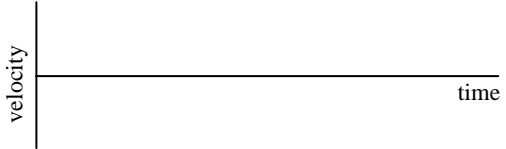
Exercise	Drawing of Range Finder Output
Standing still	
Walking towards the range finder at constant speed	
Walking towards the range finder, then stopping, then walking away from it	
Moving towards the range finder, walking faster and faster as you approach	
Moving away from the range finder, walking faster and faster as you walk away	

On the two graphs below, draw in your **prediction** of what a person moving slowly towards the range finder would measure (left) and what a person moving quickly towards the range finder would measure (right).

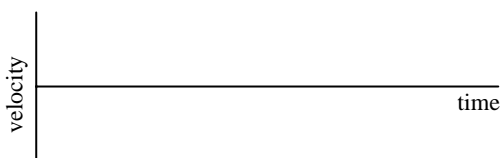


Now **verify** your prediction by making a measurement with the range finder. Were you correct? If not, go back and think about it some more. Do not "fix" your drawings above – let them stand as a reminder to yourself (you will not be marked down).

Now repeat the exercise from before, but this time look at velocity vs. time rather than position vs. time. Note the difference in the labeling of the vertical axis! As before, the horizontal axis separates positive velocities from negative velocities.

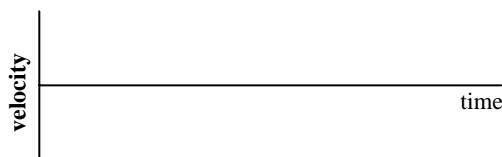
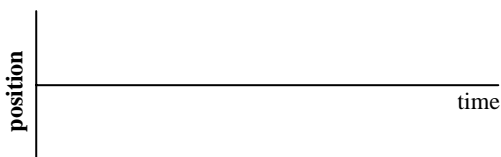
Exercise	Drawing of Range Finder Output
Standing still	
Walking towards the range finder at constant speed	
Walking towards the range finder, then stopping, then walking away from it	
Moving towards the range finder, walking faster and faster as you approach	
Moving away from the range finder, walking faster and faster as you walk away	

On the two graphs below, draw in your **prediction** of what a person moving slowly towards the range finder would measure (left) and what a person moving quickly towards the range finder would measure (right).



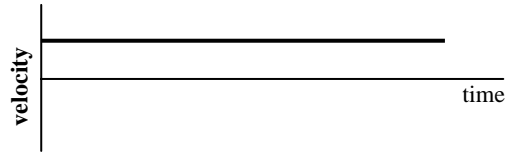
Now **verify** your prediction by making a measurement with the range finder. Were you correct? If not, go back and think about it some more. Do not “fix” your drawings above – let them stand as a reminder to yourself (you will not be marked down). You will be tested on this material later.

Next: on the graphs for position and velocity below, make **predictions** of what a person moving away from, then towards, the range finder would measure. Afterwards, **verify** your predictions as above.



Next, I would like you to make predictions about what kinds of motion will lead to different kinds of graphs. Below you will find pairs of diagrams for position and velocity. For each pair, only one of the graphs is filled. **Predict** what the other graph should look like. Then, after you have made your prediction, rate the quality of your prediction on a scale of 1 to 5. Again, you will not be graded on your accuracy (yet), so don't go back and change anything. Good scientists accept their mistakes and move on – they don't cover them up.

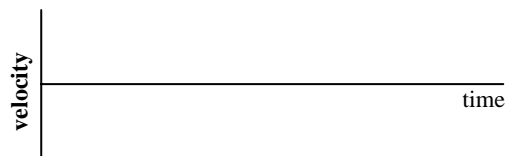
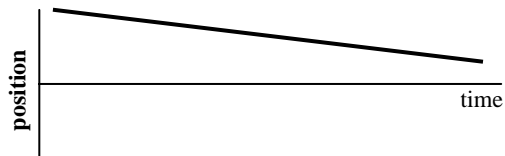
1.



Prediction quality: 1 2 3 4 5 (highest)

Notes:

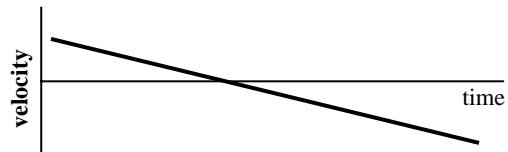
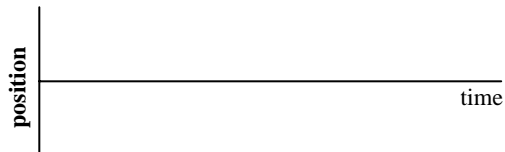
2.



Prediction quality: 1 2 3 4 5 (highest)

Notes:

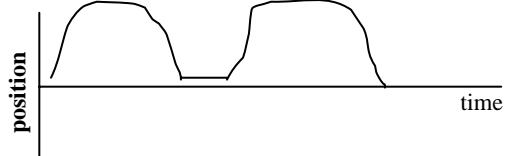
3.



Prediction quality: 1 2 3 4 5 (highest)

Notes:

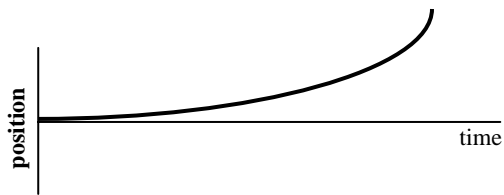
4.



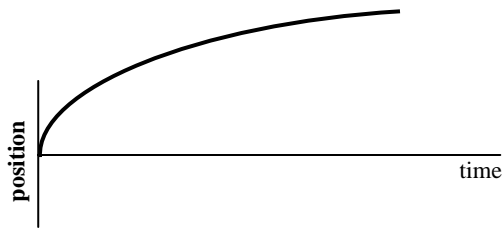
Prediction quality: 1 2 3 4 5 (highest)

Notes:

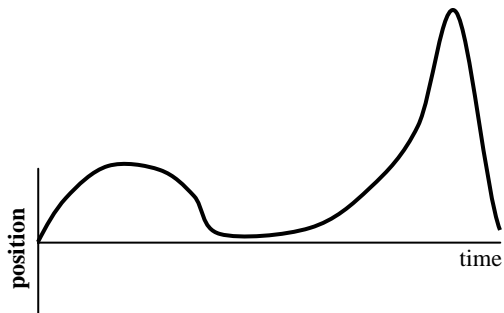
For each of the remaining graphs, figure out how to make curve shown by moving while measuring your motion with the range finder. Afterwards, describe in *words* what kind of motions you made. Try to use the words we have defined in class (speed, velocity, position, acceleration) in your description.



Description:



Description:



Description:

Answer in complete sentences:

1. What was the point of this exercise?
2. What part of this exercise did you find the most difficult? What specific steps can you take to make sure that you understand these difficulties by the time of the next exam?