Physics 2048 Test 1 Name:_____
Dr. Jeff Saul Table:_____
Spring 2001 Date:_____

READ THESE INSTRUCTIONS BEFORE YOU BEGIN

- Before you start the test, **WRITE YOUR NAME ON EVERY PAGE OF THE EXAM.**

- Calculators are permitted, but no notes or books are allowed

- If you have ANY questions while taking the test, please be sure to ask me. The purpose of the test is not to give you trick problems to catch you in an error. The purpose is to give you an opportunity to "show what you know!"

- On problems 2, 4, & 5 your answers will be evaluated on how you got them. Remember that to get full credit on a problem you will need to
  - Make a list of given information and indicate what you are trying to find
  - Start from general principles
  - Solve for the unknown quantity in symbols before plugging in numbers
  - Substitute numbers with units
  - Include units with all numeric quantities

  Partial credit will be given for correct steps shown, even if the final answer is wrong.

- Write clearly and logically so that I can understand what you are doing and can give you as much partial credit as you deserve. I cannot give credit for what you are thinking, only for what you show on your paper.

- If on a multistep problem you can't do a particular part, don't give up. Go on to the next part anyway. If necessary, define a variable name for the quantity you couldn't find and express your answer in terms of it.

Problem	Points Possible	Score
Group Problem	25	
1	20	
2	15	
3	10	
4	15	
5	15	
Total	100	

Problem 1 (Short Answer: 20 points)

An object's motion is restricted to one dimension along the + distance axis. Answer each of the questions below by selecting the velocity graph that is the best choice to describe the answer. You may use any graph once, more than once, or not at all.

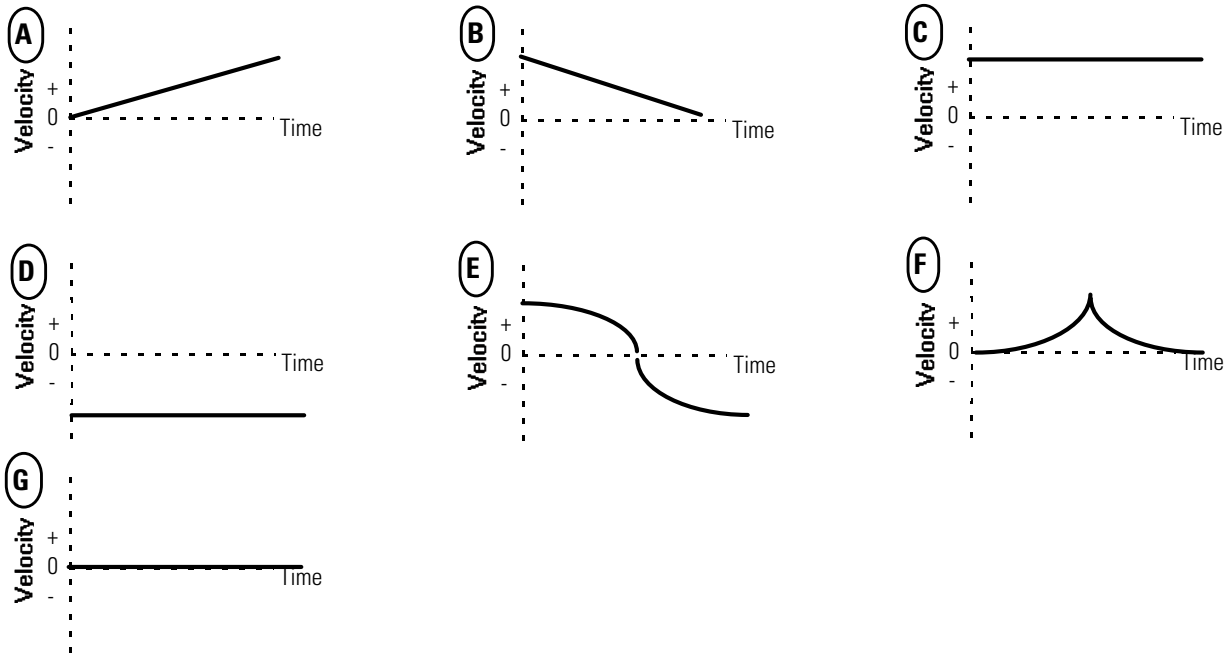
a. Which velocity graph shows an object going away from the origin at a steady velocity? (5)

b. Which velocity graph shows an object that is standing still? (5)

c. Which velocity graph shows an object moving toward the origin at a steady velocity? (5)

d. Which velocity graph shows an object changing direction? (5)

e. Which velocity graph shows an object that is steadily increasing its speed? (5)



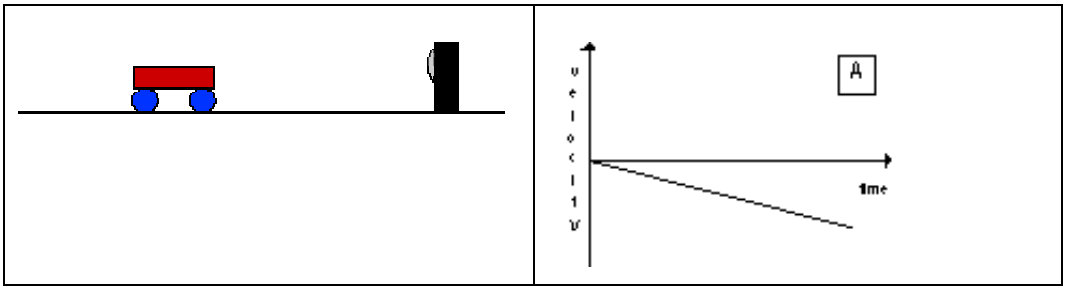
Problem 2 (Estimation Problem: 15 points)

You and a friend are planning a two-week vacation out to the West Coast for a wedding next summer. However you're both on a tight budget. Your friend thinks it would be cheaper to drive his car than fly. A cheap plane fare for one person from Orlando to San Francisco is $350 round-trip. Should you fly or drive? Realistically estimate travel expenses to and from the West Coast to see if your friend is right. What would your average speed be from Orlando to San Francisco? Assume you will have free room and board at a relative's house once you arrive.

Problem 3 (Essay 10 points)

You may use diagrams and equations but no calculations in your response for this problem.

A cart can move to the right or left along a horizontal track (the positive part of the x axis) as shown in the figure below. Assume that friction is small enough that it can be ignored. A sonic range is used (as shown) to measure the position, velocity, and acceleration of the cart. The track is not necessarily flat or horizontal. In addition, the track may be tipped or the cart may be pulled or pushed.



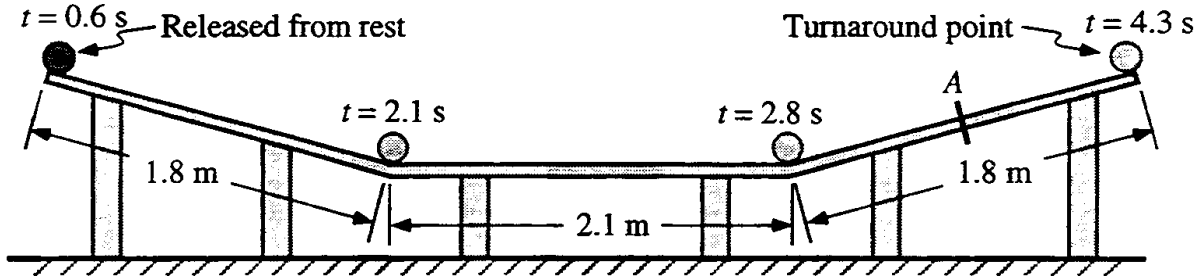
For the first run, the sonic ranger displays a graph of the velocity that looks like the graph labeled A shown at the right.

(i) Draw graphs showing what the sonic ranger would display for the cart's position and the cart's acceleration.

(ii) Describe the motion of the cart in words and explain how you drew the graphs.

Problem 4 (20 points)

A ball is released from rest at the point shown on the incline. It then rolls onto a level section of track, and then onto a second incline with the same slope as the first. The diagram below shows the location of the ball at several instants in time. NOTE: THIS IS NOT A STROBE PHOTOGRAPH OR MOTION DIAGRAM.



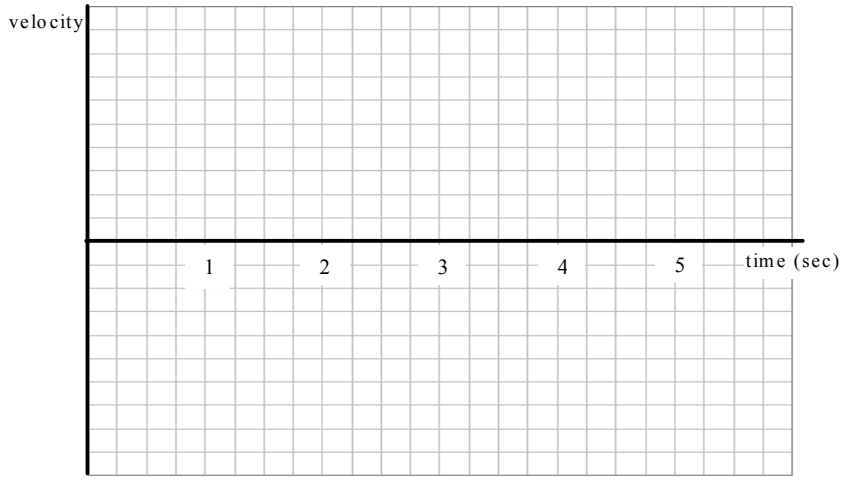
A. Determine the speed of the ball at t = 2.1 s. Show your work.

B. Determine the magnitude of the acceleration of the ball at point A (halfway up the second incline). Show your work.

C. On the diagram above, draw an arrow indicating the direction of the acceleration of the ball at point A. Explain why you drew the arrow the way you did.

D. On the diagram above, draw an arrow indicating the direction of the acceleration of the ball at t = 4.3 s (the turnaround point). If the acceleration at the turnaround point is zero, state that explicitly. Explain why you drew the arrow the way you did.

E. Graph velocity vs. time graph for the ball's motion from t = 0.6 s to t = 4.3 s.



Problem 5 (10 points)

Two carts roll toward each other on a level table. The vectors represent the velocities of the carts just before and just after they collide.

A. Draw and label a vector for <u>each cart</u> to represent the *change in velocity* from before to after the collision. Make your vectors consistent with the vectors drawn above.

B. How does the direction of Cart A's average acceleration compare to the direction of Cart B's average acceleration over the time interval shown? Explain your reasoning.

C. Is the magnitude of Cart A's average acceleration *greater than, less than* or *equal to* the magnitude of Cart B's average acceleration over the time interval shown? Explain your reasoning.

Group Test 1 (25 points) Physics 2048 Spring 2001

You have a summer job working for the UCF police department studying traffic flow on campus. There have been several complaints concerning the signal on Gemini drive by the water tower. The complaints claim that the yellow light is too short. If most cars decelerate at 10 m/s while braking, how long should the yellow light be so that people who can't stop without entering the intersection after the signal turns yellow have time to go through the 8.0 m wide intersection?

- USE THE GOAL PROTOCOL AND GROUP ROLES TO SOLVE THIS PROBLEM
- Make sure everyone's name and their group role on the GOAL Answer sheets
- YOU MAY USE 1 WHITE BOARD PER GROUP
- WORK ONLY WITH YOUR GROUP MEMBERS
- NO BOOKS OR NOTES ALLOWED

YOU WILL BE GRADED ON YOUR REASONING AND HOW WELL YOU USED THE GOAL PROTOCOL IN ADDITION TO THE CORRECTNESS OF YOUR ANSWER