Physics 2048 Test 2 Name:_____
Dr. Jeff Saul Group:_____
Fall 2002 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	13	
2	15	
3	13	
4	16	
5	18	
Total	100	

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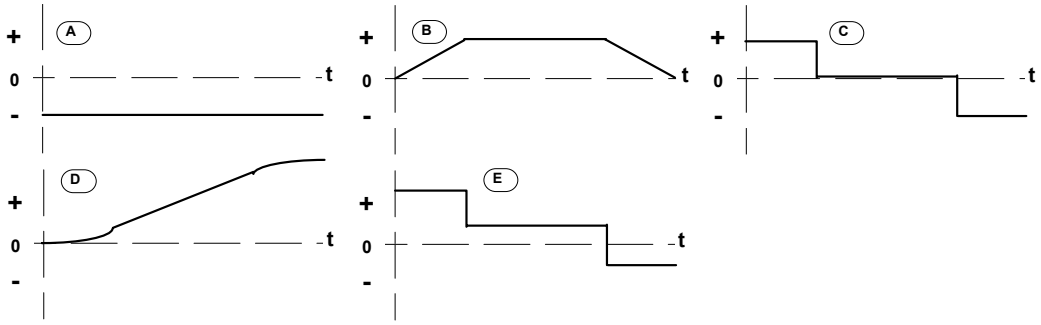
Problem 1 (Short Answer: 13 points) no explanation required, but no partial credit either.

A worker is pushing a cart along the floor. At first, the worker has to push hard in order to get the cart moving. After a while, the cart is easier to push as it moves with constant speed. Finally, the worker has to pull back on the cart in order to bring it to a stop before it hits the wall. The force exerted by the worker on the cart is purely horizontal. Take the direction the worker is going as positive.

Below are shown graphs of some of the physical variables of the problem from the time the cart started moving to when the cart came to a stop. Match the graphs with the variables in the list below. You may use a graph more than once or not at all.
(Note: the time axes are to the same scale, but the ordinates {"y axes"} are not.)

(a) friction force
(b) force exerted by the worker
(c) net force
(d) acceleration
(e) velocity.



Name:_____

Problem 2 (Estimation Problem: 15 points)

A. Estimate the amount of force needed to bring every car in the greater Orlando area from rest to highway speed in 8 seconds assuming the force is constant. Remember to state explicitly all assumptions and estimations used in solving this problem.

B. Now consider the amount of force needed to bring all those cars moving at highway speed to a sudden stop. Is this force larger, the same size or smaller than the force you calculated in part A. Explain your reasoning.

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Problem 3 (Essay 13 points)

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

In the baseball game last night, a batter hit a ball almost straight up. Explain what is happening to the ball in terms of the laws of motion we have studied. Illustrate your discussion using free-body diagrams and graphs of position, velocity, acceleration, and net force vs. time. Restrict your description to the time interval starting just after the ball has left the bat until just before it is caught.

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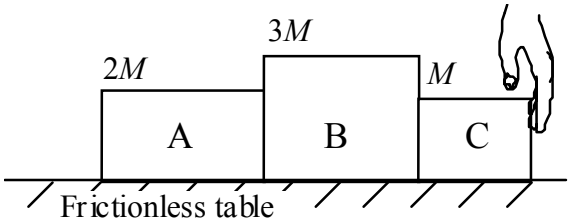
Problem 4 (18 points)

Blocks A, B, and C are being pushed across a frictionless table by a hand that exerts a constant horizontal force. Block A has mass 2*M*, block B has mass 3*M* and block C has mass *M*.



A. Draw separate free-body diagrams for each of the three blocks. Label your forces to make clear (1) the object on which the force acts, (2) the object exerting the force, and (3) the type of force (normal, frictional, gravitational, etc.)

Free-body diagram for block A	Free-body diagram for block B	Free-body diagram for block C
●	●	●

B. In the spaces at right, draw a vector that represents the *net force* on each block. Make sure your vectors are drawn with correct relative magnitudes. Explain how you knew to draw the net force vectors as you did.

Net force on Block A	Net force on Block B	Net force on Block C

C. Suppose the mass of block B were doubled (the other blocks are left unchanged) and the hand pushes with the same force as in part A.

i. Has the *magnitude* of the acceleration of block A *increased, decreased,* or *remained the same?* Explain.

ii. Has the *magnitude* of the net force on block A *increased, decreased,* or *remained the same?* Explain.

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Problem 5 (16 points)

The graph below is velocity verses time graph for a particle having an initial position $x_0 = x\ (t = 0) = 0$. Draw the corresponding position and acceleration graphs, complete with numeric scales, below from t = 0 s to t = 20 s.