

Name _____ Section _____

**University of Maryland
Department of Physics**

**Physics 121
Fall 2007**

Exam 1 (Makeup)

**Dr. E. F. Redish
18. October, 2007**

Instructions:

Do not open this examination until the proctor tells you to begin.

1. When the proctor tells you to begin, **write your full name and section number at the top of every page.** This is essential since this exam booklet will be separated for grading.
2. Do your work for each problem on the page for that problem. You might find it convenient to either do your scratch work on the back of the page before starting to write out your answer or to continue your answer on the back. **If part of your answer is on the back, be sure to check the box on the bottom of the page so the grader knows to look on the back!**
3. On all the problems *except the multiple choice questions in problem 1 or where it says not to explain*, your answers will be evaluated at least in part on how you got them. If explanations are requested, more than half the credit of the problem will be given for the explanation. **LITTLE OR NO CREDIT MAY BE EARNED FOR ANSWERS THAT DO NOT SHOW HOW YOU GOT THEM.** Partial credit will be granted for correct steps shown, even if the final answer is wrong.
4. Write clearly and logically so we can understand what you are doing and can give you as much partial credit as you deserve. We cannot give credit for what you are thinking — only for what you show on your paper.
5. All estimations should be done to the appropriate number of significant figures.
6. At the end of the exam, write and sign the honor pledge in the space below:
“I pledge on my honor that I have not given or received any unauthorized assistance on this examination.”

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#1:	#2:	#3:	#4:	#5:	Total
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***** Good Luck *****

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**Dr. E. F. Redish
Exam 1 (M.U.)**

1. (35 points) In the picture at the right (taken from a video), a juggler is shown in the process of juggling three tennis balls.

At the instant shown,

- The ball at the right (labeled “A”) is traveling upwards; he released it a few frames earlier.
- The middle ball (labeled “B”) is traveling downwards; he is about to catch it.

Both balls are traveling approximately vertically only; they have negligible horizontal motion.

For the vector quantities specified in parts (a)-(e) below, specify whether they point up (\uparrow), down (\downarrow), left (\leftarrow), right (\rightarrow), or are zero (0) by inserting the appropriate symbol in the space provided.

For this problem, assume that air resistance can be ignored. (5 pts. each)



Parts (a)-(c) refer to the instant of time shown.

- _____ (a) The net force on ball A.
- _____ (b) The net force on ball B.
- _____ (c) The acceleration of ball A.
- _____ (d) The acceleration of ball B.

Parts (e)-(g) refer to the instant of time when ball A is at the TOP (the highest point) of its trajectory.

- _____ (e) The acceleration of ball A.
- _____ (f) The net force acting on ball A.
- _____ (g) The velocity of ball A.

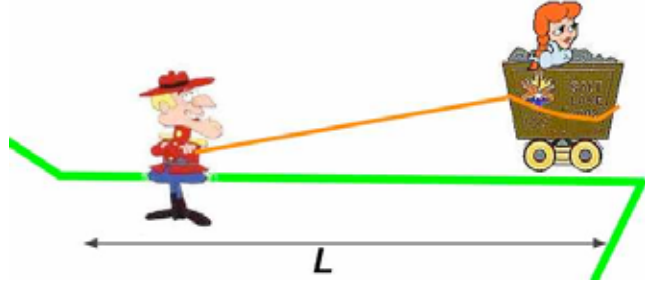
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Exam 1 (M.U.)

2. (15 points) Little Nell is in trouble. Boris Badenov has tied her up and put her in an ore cart at an abandoned mine. The cart was is on a track at the top of a hill. The track runs down the hill, onto a flat stretch, and then over a cliff. Boris pushes the cart down the hill, but Dudley Dought is there and lassos the cart just as it comes off the cliff. By digging in his heels and being dragged along the ground, he is able to exert a constant force of 1000 N on the cart and bring it to a stop in 5 s – just before it is about to go over the cliff! The cart (including Nell) has a mass of 250 kg.



(a) How fast was the cart going at the start of the long flat stretch? (Although the mine is long abandoned, Boris has been keeping the wheels of the cart oiled for just such an opportunity and friction can be ignored.) (8 pts)

(b) How long was the long flat stretch? (7 pts)

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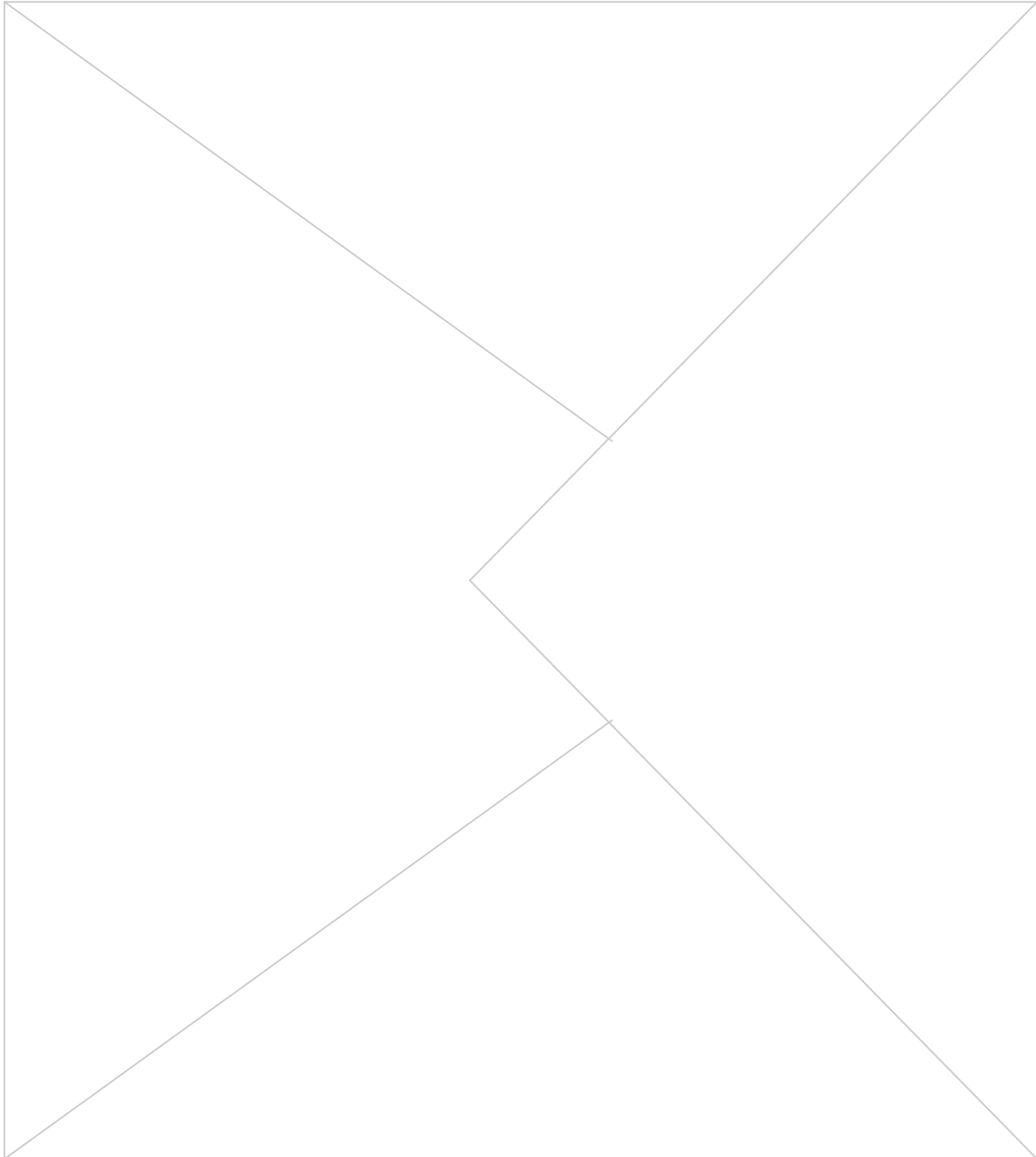


NAME _____ SECTION _____ POINTS _____

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3. (10 points) Estimate how fast your hair grows in km/hr. Express your answer in scientific (powers of 10) notation. *Be sure to clearly state your assumptions and how you came to the numbers you estimated, since grading on this problem will be mostly based on your reasoning, not on your answer.*



If you need more space, continue on the back and check here.



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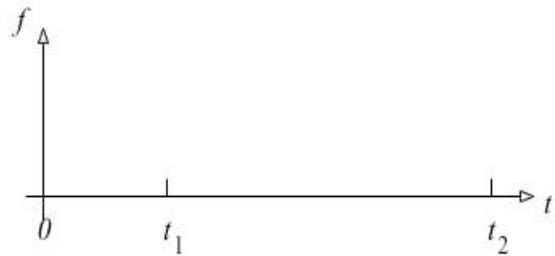
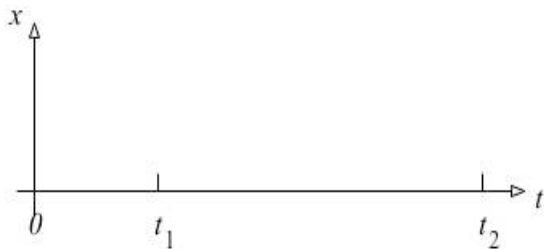
5. (30 points) Rebecca has put her puppy, Molly, on a skateboard, and has attached a rope to the skateboard in order to give Molly a ride. At time $t = 0$, Rebecca starts pulling on the rope. She is pulling upward at an angle of 37° . Once she is up to speed (at time t_1), she runs along at a constant rate until a time t_2 . A little after that, her mother yells at her and she stops.



(a) While Rebecca is pulling, draw free-body diagrams for Molly and the skateboard. Label the forces so as to identify the kind of force (N , T , f , W) and the actors (the one feeling the force and the one causing it). (10 pts)

Molly	Skateboard
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(b) In the spaces provided below, sketch appropriate graphs representing Molly's position, velocity, acceleration, and the friction force Molly is experiencing. (5 pts. each)



If you need more space, continue on the back and check here.

