Physics 211 Group Exam 1, Form 2

Problem 1	Problem 2	Total
/25	/25	/50

Name: _____

Partner #1: _____

Partner #2: _____

Recitation section number: _____

- There are two questions, each worth twenty-five points.

- **You must show your reasoning to receive credit**. A numerical answer with no logic shown will be treated as no answer.

- You are highly encouraged to use both pictures and words to show your reasoning, not just algebra.

- If you run out of room, ask for an extra sheet of paper, or get one from your notebook.

- how your reasoning as thoroughly as possible for partial credit.

- You may use $g = 10\,\mathrm{m/s^2}$ throughout, except where indicated, to minimize arithmetic.

QUESTION 3

Toby the Cat is sitting on a high shelf at a height of $h = 2$ m off of the ground. Her owner is lying on the floor in front of the shelf when she throws a toy ball straight upward at $v_0 = 6.5$ m/s. As soon as the ball passes the level of the shelf (2 m off of the ground), Toby tries to catch it. She can grab the ball as long as it is above the level of the shelf. If Toby does not grab the ball, it falls back down where her owner catches it again.

In this problem, you will calculate how much time Toby has to grab the toy before it falls back below the shelf.

a) Assuming that Toby doesn't grab the toy out of the air, sketch graphs of the ball's position, velocity, and acceleration as a function of time, from the time her owner throws it to when she catches it again. Indicate the height of the shelf on the position vs. time graph. You do not need to show precise numbers on your graphs, just their shape. Draw these graphs on the axes below. *(10 points)*
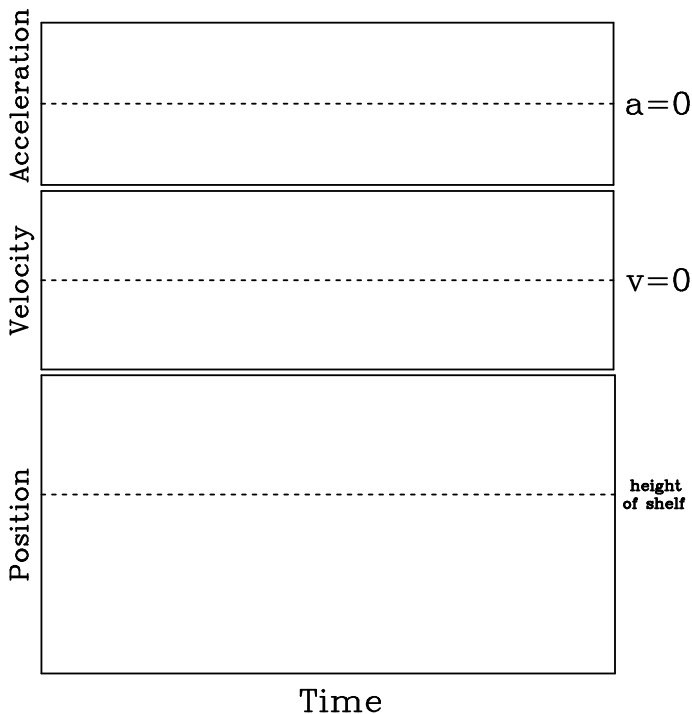
Toby the Cat and her blue toy ball. She is 15 years old and spoiled rotten by her mommy, as you can tell by all the cat toys she's surrounded by.

b) Write down algebraic expressions for the position and velocity of the ball as a function of time. *(10 points)*

c) How much time does Toby have to grab the ball? (This is the total amount of time that it is above the level of the shelf.) *(10 points)*

d) Suppose that her owner instead throws the ball upward with a starting velocity of 5 m/s rather than 6.5 m/s. In this scenario, how much time will Toby have to grab the ball? *(5 points)*

QUESTION 4

A walnut tree grows 100 meters north of a pecan tree.

A squirrel takes a walnut from the walnut tree, travels 30 meters at an angle 20 degrees south of east, and buries his walnut.

Another squirrel takes a pecan from the pecan tree, travels 50 meters due west, and buries her pecan.

a) How far apart are the two buried nuts? *(15 points)*

b) If someone wanted to walk from the buried pecan to the buried walnut, in which direction should they walk? *(10 points)*