Physics 211 Group Exam 1, Form 1

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.

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Question 1

Otto and Sue are two hawks that live on the Syracuse University campus. Their nest is on Lyman Hall; they raise chicks there every year.

Suppose that their daughter (a bird that has just learned to fly) leaves their nest and flies 250 meters at an angle 40 degrees south of west before landing on the top of the Physics Building.

Otto, being a good father, wants to get his daughter some dinner. He flies 200 meters straight west from their nest and lands on top of the Hall of Languages, looking around for something to eat. From there, he flies 300 meters at an angle 25 degrees north of east and catches some prey.

Finally, he flies to his daughter on top of the Physics Building and brings her the food.

a) Sketch a diagram of the paths that each of the hawks flies. Label each vector with a letter (e.g. $\vec{A}$, $\vec{B}$, $\vec{C}$...) *(5 points)*

b) Write a vector equation that relates these vectors together (e.g. $\vec{A} + \vec{B} = \vec{C}$). *(5 points)*

Question 1, continued

c) What *distance* must Otto fly after he catches dinner in order to bring it to his daughter? *(10 points)*

d) What *direction* must Otto fly after he catches dinner in order to bring it to his daughter? *(5 points)*

Question 2

A hollow ball falls into a pond from a height of 1m. While it is in the air, it is in freefall. When it is underwater, it has an acceleration of 5 m/s^2 upward, because it is light enough to float. The pond is 3m deep.

You may assume that its velocity does not change as it passes through the surface of the water.

a) With what velocity does it strike the surface? *(5 points)*

b) Does the ball reach the bottom of the pond before it rises back to the top? *(5 points)*

c) How long after it is dropped does it take for the ball to reach the surface again? *(5 points)*

Question 2, continued

d) Graph acceleration vs. time, velocity vs. time, and position vs. time on the axes provided. *(10 points)*