PHYS 111
HOMEWORK #3

Due : 15 Sept. 2016

1. Let' s try it the right way this time. A person begins walking at noon one day from point A and travels at a constant velocity along a straight line path to point B a distance D away, arriving at 7 pm that evening. The very next day, the traveler leaves B at exactly noon, travels at a different constant velocity along exactly the same path, arriving at A at 3 pm.

Is there any point along the path that the traveler reached at the same time on both days? Justify your answer. If you conclude that there is such a time, determine the time at which this point was reached the location (distance from A) of this point.

2. A student runs to catch the campus shuttle bus which is stopped at a red light. The student runs at a constant speed of 6 m/s (and can run no faster) to catch the bus. When the student is still 60 m from the (front door of) the bus, the bus begins to move and moves away at a constant acceleration of 0.18 m s^{-2}.

a) For how long and how far does the student have to run before reaching the bus? (10)

b) You should have found a second solution to the equation you solved for part a). What is the significance of the second solution? (Your graph from part d) might help you answer this question.) What is the speed of the bus at that time? (5)

c) If the student ran at a constant speed of 4 m/s, would the student catch the bus? (5)

d) Use a real piece of graph (or quadrille) paper and draw the graphs of the motion of the bus and student on the same set of axes. Make sure axes are labeled and appropriate numerical values are placed on the axes. (5)

e) What is the minimum constant speed the student could have and still catch the bus? How long would the student have to run at this speed to catch the bus. (10)

3. A ball is thrown vertically down from a building of height H with an initial speed of v. At the same time, an identical ball is thrown vertically upward from the same location with an initial speed of v. Which ball will hit the ground with the greater speed? Justify your answer either using logic or equations (of course, no credit will be given for merely citing an answer).

4. Consider the situation just described in problem 3. Determine the difference of the balls' arrival times on the ground. (Do not use numerical values for H or v; determine this using variables only.) Explain why this is the answer you could have predicted without doing any calculations.

5. Problem 72, p. 63 of text. Five points for each part.