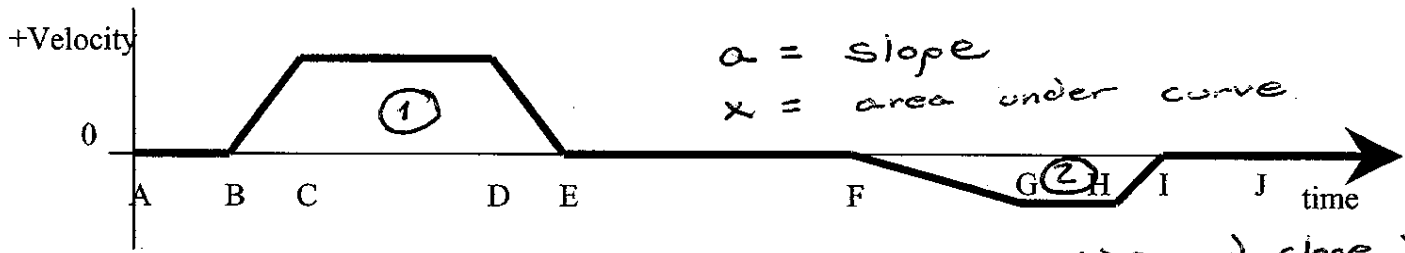
Name CS Disc Section A4

Conceptual Exercise 1 – PY105 – May 24-25, 2007

Part 1. The graph below is the velocity of a Commonwealth Avenue Green-Line train. (Pos = East or inbound, Neg = West or outbound). The train goes inbound for a while, stops and waits, and then backs up for a while. The letters identify the endpoints of the time intervals during which the velocity varies linearly or remains constant.



a = slope
x = area under curve

A) (1 pt) During which time interval(s) is
1) the velocity in the same direction as the acceleration? BC, FG (v>0 and slope >0; v<0 slope <0)

2) the velocity in the opposite direction as the acceleration? DE, HI (v>0, slope <0; v<0, slope >0)

B) (1 pt) After the train has backed up from the position at time EF to the position at time I J, has it gotten back to the original position at time AB? How can you tell?

Nope, area (1) > area (2)
(displacement = area under curve)

Part 2. A small car and large SUV are each traveling at 18 m/s toward each other on a one-lane bridge. The drivers notice this at the same instant (t=0).

A) (1 pt) The driver of the small car has a reaction time of 1 second and then brakes with constant acceleration for 10 seconds before coming to a halt. What is the distance traveled during each part of car's the motion? {Hint: For each interval of constant acceleration, the distance is the average velocity times the time}

$$x = (18\ m/s)(1\ s) + \frac{18\ m/s + 0\ m/s}{2}(10\ s) = 108\ m$$

B) (1 pt) The driver of the SUV takes 3 seconds to say goodbye on his cell phone, and then panic brakes with constant acceleration, coming to a halt in just 6 seconds. What is the distance traveled during each part of the SUV's motion?

$$x = (18\ m/s)(3\ s) + \frac{18\ m/s + 0\ m/s}{2}(6\ s) =$$

$$x = 108\ m$$

C) (1 pt) Both the car and the SUV travel the same total distance before stopping. Is this an accident (no pun intended), or is it a general result that applies to all problems of this type? Justify your answer.

Just dumb luck. Suppose the driver of the SUV does not break at all, then it would travel farther than the small car.