Describing Motion in One Dimension

Pre-Class Questions:

1. Which things do I look at for the pre-class work?
2. What's the difference between position and displacement?
3. What's the difference between speed and velocity?
4. What's the difference between velocity and acceleration?
5. They put 'north' after the distance, what should we do if the direction between the north and east or south and west?
6. Why is the direction important in a vector?

Problem Set (due next time)
Ch 2 - 2,13,19,22

Lecture Outline

1. The Definitions of Position and Displacement
2. The Definition of Average Velocity
3. The Definitions of Instantaneous Velocity and Speed
4. The Definitions of Average Acceleration and Instantaneous Acceleration

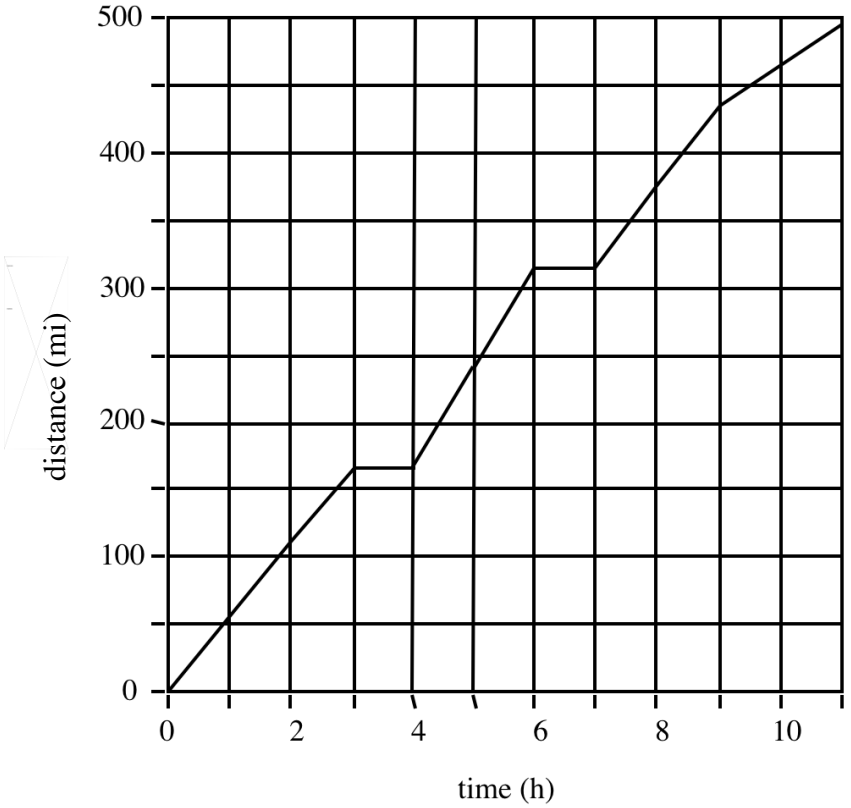
Example 1: At the right is a graph of my last trip to Los Angeles. The origin is at Chico. Find

(a) my position at t=2h,

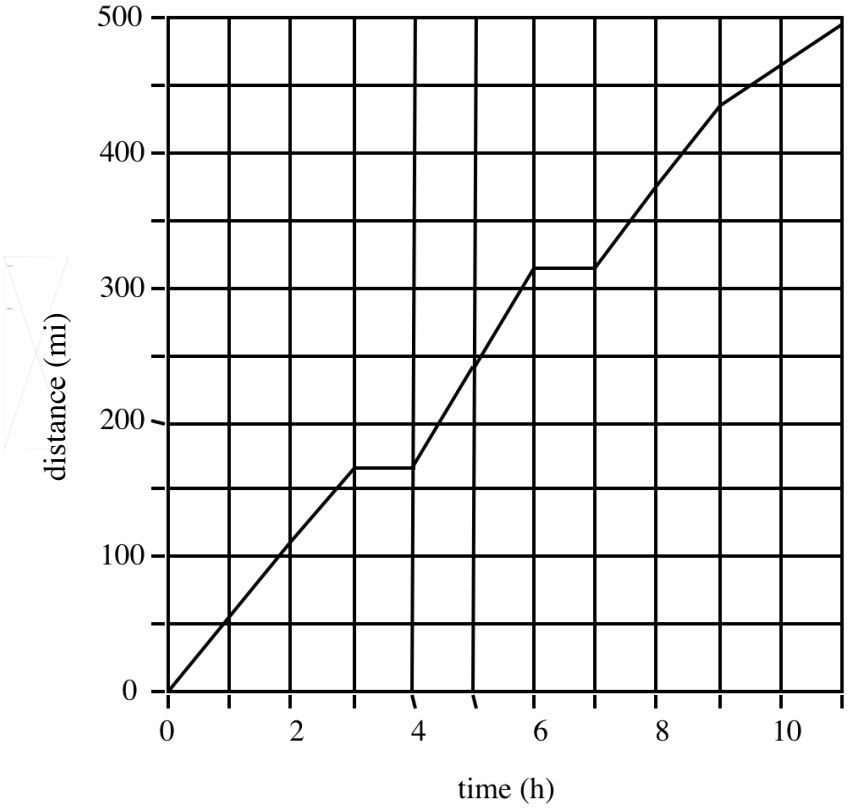
(b) my position at t=8h,

(c) my displacement during these 6h and

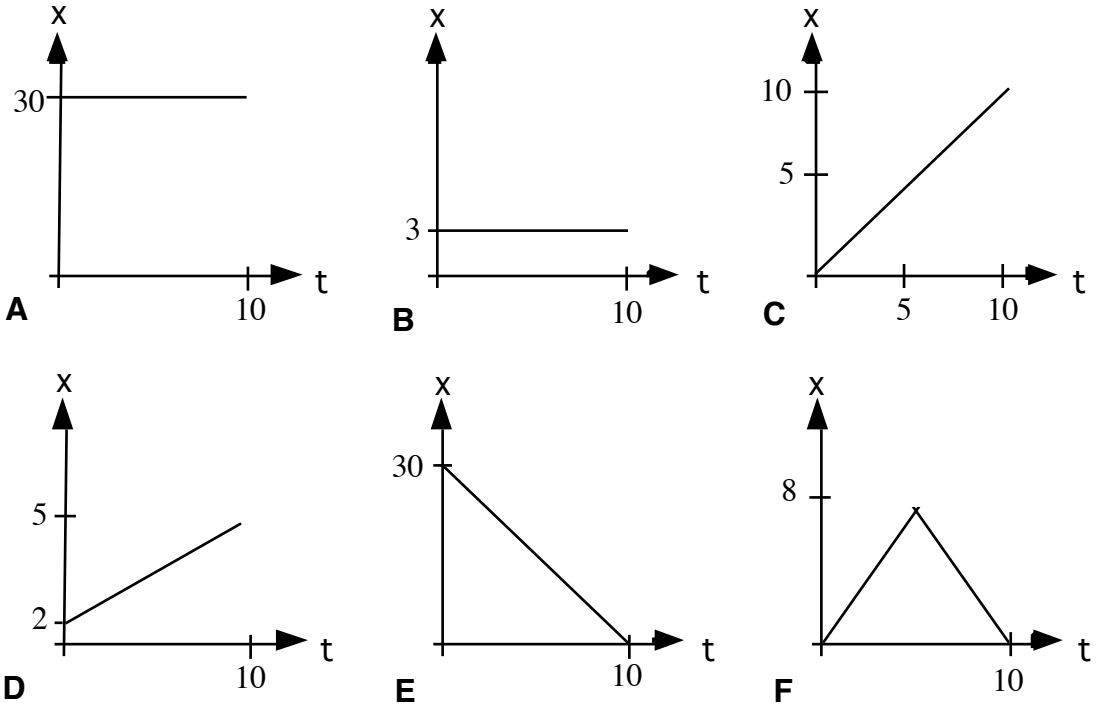
(d) my total displacement.



Example 2: Find my average velocity during the interval from t = 2h to t = 8h.



In the position vs. time graphs below, all the times are in seconds (s), and all the positions are in meters (m). Rank these graphs on the basis of which graph indicates the greatest average speed, where the average speed is calculated from the beginning to the end of motion. Give the highest rank to the one(s) with the greatest average speed, and give the lowest rank to the one(s) indicating the least average speed. If two graphs indicate the same average speed, give them the same rank.



Greatest 1_____ 2_____ 3_____ 4_____ 5_____ 6_____ Least

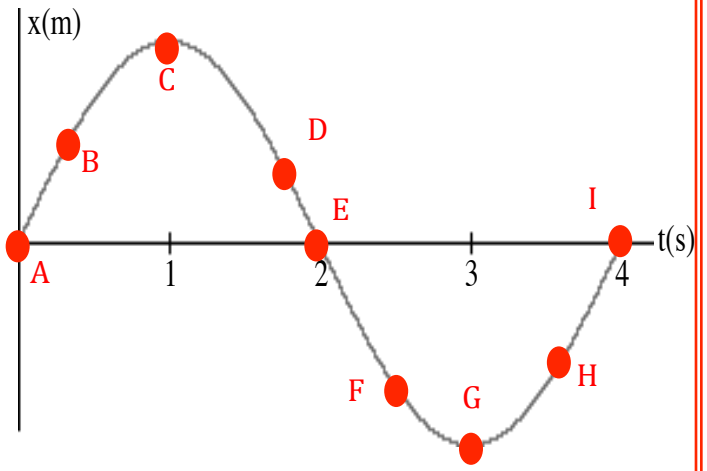
Or, none of these are moving at all. _____

Or, the average speed is the same for all of these. _____

Please carefully explain your reasoning.

1. The graph of position versus time for an object is shown at the right. For which labeled points does the object have

(a)a displacement to the right of the origin,
(b)a displacement to the left of the origin,
(c)a position at the origin,
(d)a positive instantaneous velocity,
(e)a negative instantaneous velocity,
(f)does the object have a velocity of zero.



Example 3: An advertisement claims a car can go from zero to 60mph (26.8m/s) in 6.00s. Find the average acceleration of the car. .

Lecture 02 - Summary

Quantity	Definition	Mathematical Representation
Position	The location of an object with respect to a coordinate system.	x
Displacement	A change in position.	$\Delta x \equiv x_f - x_i$
Average Velocity	The average rate of displacement.	$\bar{v} \equiv \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i}$
Instantaneous Velocity	The instantaneous rate of displacement.	The slope of the tangent line on the x vs. t graph or $v \equiv \frac{dx}{dt}$.
Average Acceleration	The rate of change of velocity.	$\bar{a} \equiv \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{t_f - t_i}$
Instantaneous Acceleration	The instantaneous rate of change of velocity.	The slope of the tangent line on the v vs. t graph or $a \equiv \frac{dv}{dt}$.