

AP Calculus BC
Lesson 2.1 Openers

1. At 2:00 PM a car pulls onto I-75 heading north from Chattanooga.

Let $D(t)$ = the car's distance, in miles, north of Chattanooga, and $V(t)$ = the car's northward velocity, in miles per hour, where t is the number of hours after 2:00 PM.

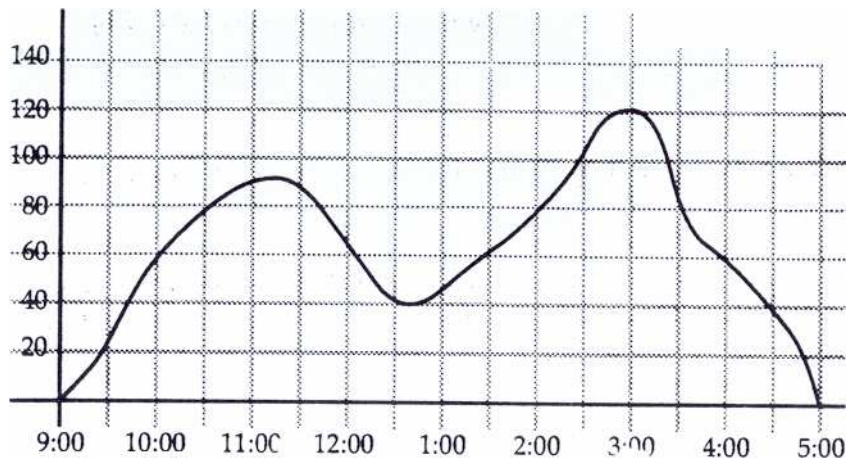
- a) If $D(1) = 50$ and $V(1) = -60$, describe what this says about the location, direction, and speed of the car at 3:00 PM.
- b) What would it mean for $D(2)$ to be 100 and $V(2)$ to be 20?
- c) If the car makes a U-turn at 4:00, find $V(2)$
2. The following data are taken from a horse race that is one quarter of a mile. The time is given in seconds after the start of the race and the distance is given in yards from the starting line.

Time (sec)	2	4	6	8	10	12	14	16	18
Distance(yds)	29	59	90	123	165	208	253	299	347

- a) At what speed is the horse running 8 seconds into the race?
- b) What is the average speed of the horse during the first 8 seconds of the race?
- c) At what speed is the horse running halfway (measured by distance) through the race?
- d) Estimate a measure of the acceleration of the horse 8 seconds into the race.
- e) The jockey will win a bonus if the horse finishes the race with a time under 22 seconds. Do you think that the jockey will win the bonus? Why or why not?
3. A car makes a trip traveling at two different speeds: 40 mph and 60 mph. What is the average speed for his entire trip if
- a) the car travels for half of the time at 40 mph and half of the time at 60 mph?
- b) the car travels half of the distance at 40 mph and half of the distance at 60 mph?

4. Consider the curve $y = 2^x$ and the point $(1, 2)$.
- Find the slope of the secant line to the curve at $(1, 2)$ that also passes through the point where $x = 2$. Write an equation for this line.
 - Find the slope of the secant line to the curve at $(1, 2)$ that also passes through the point where $x = 1.1$.
 - Find the slope of the secant line to the curve at $(1, 2)$ that also passes through the point where $x = 0.9$.
 - What do you think is a reasonable approximation for the slope of the tangent line to the curve at the point $(1, 2)$?
 - Write an equation for the tangent line to the curve at the point $(1, 2)$ and graph this line with the curve.

5. A salesman travels among several towns located next to a straight highway. The graph at right gives the salesman's distance from his home (in miles) at a given time on Friday.



- What was the salesman's average speed from 9 AM to 10 AM?
- What was the salesman's average speed from 3 PM to 4 PM?
- The salesman was clocked (and pulled over) by a policeman at 3:30. How fast was he driving at this time?
- What was the salesman's average speed from 9 AM to 5 PM?
- What was the salesman's average velocity from 9 AM to 5 PM?