Agenda (Day 1): The Idea of the Derivative *(as a rate function)*

Objective: SWBAT begin to develop the idea of the derivative as a rate function.

SWBAT interpret function notation and use it to correctly justify the meaning of a statement in a real-world context.

1) Do Now: Start to look at the graphs on the handout...Spend 3-5 min, studying the graph, making/writing observations and discussing with your group.

2) Notes: Our first description/informal definition of the derivative (10 min)

3) Class discussion: The key points in interpreting the graph(10 min)...

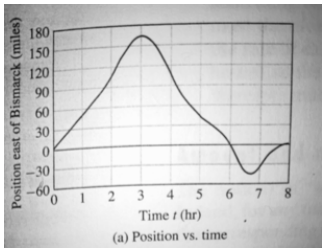
4) Handout #1-5 in groups and then discuss (5 + 5 min)

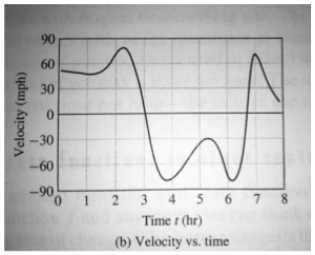
5) Quick Exit Ticket...on phone?

Homework: Tell the story (to be collected as a check-in)

Google Information Survey, Review Course Expectations

Day 1: Position, Velocity, Acceleration





P(t) = the car's position at time t, measured in miles east of the State Capitol on ramp

V(t) = the car's eastward velocity at time t, measured in miles per hour

OUR TASK: Tell the story...interpret the graph in a real world context.
Note: Since... then...

What does it mean for P(t)>0? for P(t)<0?
The car is east of on ramp. Car is west of on ramp

What does it mean for V(t)>0? V(t)<0? V(t)=0?
The car is moving east, Car is moving west, Neither east nor west

What does it mean for P(t) to change from positive to negative? The car is switching from being east of on ramp to west of the on ramp

What does it mean for V(t) to change from positive to negative? The car is changing direction of travel from east to west

What does it mean for P(t) to have a maximum? a minimum? Farthest east " " west " " of on ramp

What does it mean for V(t) to have a maximum? a minimum? Fastest speed east, Fastest speed west

BIG QUESTION OF CALCULUS

What is the derivative? f' f prime

First Definition: Let *f* be any function; the new function *f'*, called the derivative (or rate function) of *f* is defined by:

instantaneous rate of change of f

For *P(t) [or s(t)],* the derivative is *V(t) or s'(t)=v(t)* = $P'(t)$

Remember, velocity (and position) are vector quantities. They have both magnitude and direction.

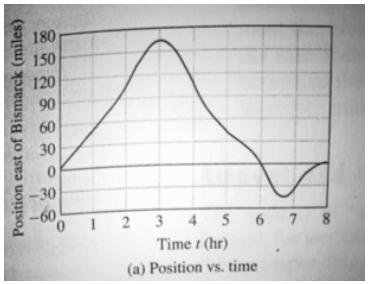
For *V(t)* the derivative is *A(t) OR a(t)=v'(t)=s''(t)* (Don't worry about this)

What are the units for these quantities?

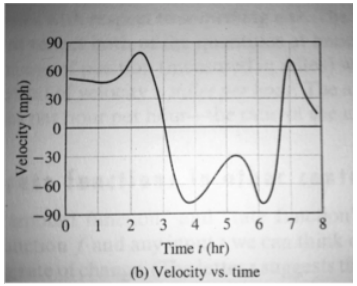
v(t)=miles/min...a(t)=miles/min/min ?

Rate can be the change of many different real world variables: snowfall, sand accumulating on a beach, oil flowing from a tank.

What are the key points in interpreting our position and velocity graphs?



(a) Position vs. time



(b) Velocity vs. time

Let's tell the story...

(This is your homework . . .)

Use these questions as a way to help you analyze and interpret the meaning of function notation in the context of our car trip. Use correct units.

1) What does the statement $P(2)=100$ mean?

At 2 hours, the car is 100 miles east of the on ramp

2) What does the statement $P(7)<0$ mean?

The car is west of the on ramp at 7 hours.

3) What does the statement $V(2)=70$ mean?

At 2 hours, the car is traveling at 70 mph east.

4) What does the statement $V(6.5)=-60$ mean?

At 6.5 hours, the car is traveling 60 mph west.

5) What does the statement $V(t)=P'(t)$ say about the relationship between the functions P and V?

The velocity is the instantaneous rate of change of position.