Agenda (Day 6): **Wrapping up...**

1) Mindfulness Lesson

2) Questions on HW

3) Another Approach to bounds, the Speed Limit Law

4) Greatest Hits...what will be on the test?

Another way of looking at the Racetrack Principle:

The Speed Limit Law: Let f be a function defined for x in $[a,b]$, and let M be any real number. If

$$f'(x) \le M$$

for all x in $[a,b]$, then

$$f(b)-f(a) \le M(b-a)$$

1) Let f(x) be the **position** of a car and f'(x) its velocity.

2) f'(x)<=M means that M is our speed limit and **the slope of f(x)** never exceeds M for any x on our interval [a,b].

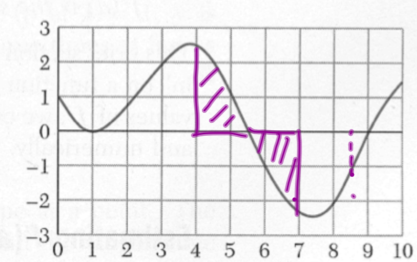
3) f(b)-f(a) is the car's **displacement** on the interval [a,b]...the speed limit law says that this displacement cannot exceed the product of the speed limit, M and the time elapsed (b-a).

Think, Pair Share

In your groups, take minute to think about this new presentation and compare this "speed limit law" to the work we did in our examples. Then we will re-group for questions.

29. The graph of the derivative of a function g is shown below. Use the graph of g' and the racetrack principle to answer the following questions about g. [NOTE: The graph of g is not shown.]

Graph of g'



Problem #29, page 107, Ostebee Zorn

How can we use speed limit to do these?

$g'(x) \geq 0.5$

(a) Is $g(2) < g(5)$? Justify your answer.
(b) Is $g(6) > g(8)$? Justify your answer.
(c) Rank the five numbers ~~0~~, ~~1~~, $g(2) - g(1)$, ~~$g(8) - g(7)$~~, and $g(9) - g(8)$ in increasing order.
(d) Rank the four numbers $g(0)$, $g(1)$, $g(3)$, and $g(5)$ in increasing order.

$g(5) - g(2) \geq 0.5(5-2)$

$g(5) - g(2) \geq 1.5$

So $g(5) > g(2)$

$g(7)$

$g(7)$? here would it go?

$g(8)-g(7)$ $g(9)-g(8)$ 0 $g(2)-g(1)$ 1

SEE THE CORRECTION IN NOTATION BELOW!!!

Mrs. Letourneau was in Car B while her husband was driving. She can't help but think like a Calculus Teacher, even when she's on a road trip, so she recorded the car's **position** relative to the EZPass checkpoint. Here is the data she collected:

t (minutes)	0	10	15	22	30
D (miles)	0	9.8	14.6	21.1	29.0

ii. What is the best estimate for the **velocity** of Car B at time t= 12 given the data provided? Represent this value using appropriate function notation.

~~$\boxed{V(t)=D'(t)} \approx 0.96$ miles/min (West)?~~

CORRECTION!!!!

$\doteq$

$V(12)=D'(12)$

$\cancel{V(t)=D'(t)} \approx \dfrac{D(15)-D(10)}{15-10} = 0.96$ mi/min

Make sure you distinguish between the general rule for a function [V(t)] and the values of the function at specific points [V(12)].

Greatest Hits!

For the test, you should able to:

- understand/interpret/explain the idea of the derivative as a rate function.
- interpret function notation and use it to correctly justify the meaning of a statement in a real-world context.
- understand/interpret/explain the idea of the derivative, this time as a slope function.
- make connections between the function, its derivative and the tangent to the function.
- estimate the value of the derivative at a point from a graph.

- to understand and apply the concept of local linearity to estimate derivatives at a point (no technology on the test)

- to recognize and affirm that the derivative of a function is a function itself and predict a rule for the derivative function.

- write/estimate the equation of a tangent line to a curve at a point

- to identify a difference quotient in the context of a problem

- to use values of the derivative to estimate the value of the function in a context

- estimate the derivate and assign appropriate units give a table of values.
- use the derivative to predict bounds for the value of a function on a given interval given a point and restrictions for the rate of change of the function on the interval.