

## AP Calculus Semester 1 Final - Concepts to Review

*\*These are just a sample... you need to know everything we have discussed so far\**

### ***Limits***

Understand the definition of a limit and what it tells us.

Know how to calculate limits by the various limit laws we discussed.

Know the special trig limits we discussed.

Be able to find the tangent at a point using both limits and derivatives.

### ***Continuity***

Know what continuous means.

Know how to determine if a function is continuous.

Suppose you are given a piecewise function with a variable "c". Know how to determine what values of "c" will make the function continuous. Example such as #41 on p.107

If a function is continuous, must it be differentiable?

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### ***Derivative***

What does  $f'(x)$  tell us?

What does  $f''(x)$  tell us?

Understand the terms and how to find, maximum, minimum, inflection points, intervals of concavity, etc.

Know how to tell when a function is increasing/decreasing.

What is the relationship between slopes and derivatives?

Know how to apply first and second derivative tests.

If you are given a table of values for  $x$  and  $f(x)$ , how could you approximate the derivative at a specific point?

Know how to take the derivative using your calculator.

Know the product, quotient and chain rules to be able to find derivatives of various equations.

Given the graph of  $f(x)$  be able to sketch a graph of  $f'(x)$

### ***Integral***

What is the integral?

What is a Riemann sum?

Make sure you understand how to find Riemann sums using left/right endpoints, midpoint or trapezoid rule.

Know how to find both definite and indefinite integrals. (Also know how to find definite integrals on your calculator).

What is the relationship between the integral and the derivative?

Given a graph of a function, what does the integral mean to this?

Make sure you understand the Fundamental Theorem of Calculus parts 1 and 2.

Given a graph of  $f'(x)$  be able to sketch a graph of  $f(x)$ .

### ***Particle Motion***

Know the relationships between  $s(t)$ ,  $v(t)$  and  $a(t)$ .

Given  $s(t)$ , how would you obtain  $v(t)$ ?  $a(t)$ ?

Given  $a(t)$ , how would you obtain  $v(t)$ ?  $s(t)$ ?

Given  $v(t)$ , how would you obtain  $a(t)$ ?  $s(t)$ ?

How do you find the total distance traveled given the graph of  $v(t)$ ?

Suppose a particle *starts at rest* and you know the equation for  $a(t)$ . How would you find the total distance traveled? Hint: Starts at rest means  $v(0) = 0$ !

Suppose you have the graph of  $a(t)$ , how would you find the velocity at a certain point in time?

Suppose you have the graph of  $a(t)$ , how would you find the max or min velocity?

Suppose you are given  $v(t)$ , how could you tell when the particle changes direction?

### ***Related Rates***

Know how to do them!

Study formulas... Volume of a Sphere, Cylinder, Cone, etc.

### ***Optimization Problems***

Know your formulas and how to apply first and second derivative tests.

### ***Differential Equations***

Know how to differentiate implicitly.

Suppose you are given  $\frac{dy}{dx}$ , how would you find  $y = f(x)$ ?

### ***Misc Items***

Know how to graph various functions.

Know how to find vertical and horizontal asymptotes.

Understand (and how to apply) the MEAN VALUE THEOREM.