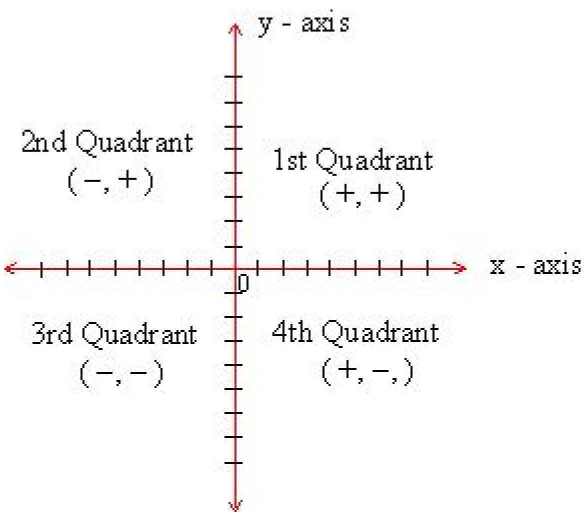
AP Calculus AB Studyguide - Test #1 - Lessons 1-24

Chapter 4 and 5

- Radians:
  - o Conversion from radians to degrees = π rad/180 degrees
  - o Conversion from degrees to radians= 180 degrees/ π radians
- MEMORIZE THE UNIT CIRCLE

$$\tan\theta = \frac{\sin\theta}{\cos\theta} \qquad \cot\theta = \frac{1}{\tan\theta} = \frac{\cos\theta}{\sin\theta}$$

$$\sec\theta = \frac{1}{\cos\theta} \qquad \csc\theta = \frac{1}{\sin\theta}$$



Problems

1. Simplify:
   a. Cos(x)sin(x)/tan(x)
   b. (cotx)(sinx)-cos(x)
2. Evaluate:
   a. Sec^2 5 π /4 +2tan- π /4

Chapter 6-7

- Domain: set of inputs
- Range: set of outputs
- The notation f(x) represents the function at some point
- Vertical line test: if the vertical line hits more than one point at that value x then that graph is not a function.

Chapter 9

- Exponential form N=b^l
- Log form: logbN=L
- Properties of logs:

Property	Definition	Example
Product	$\log_b mn = \log_b m + \log_b n$	$\log_3 9x = \log_3 9 + \log_3 x$
Quotient	$\log_b \frac{m}{n} = \log_b m - \log_b n$	$\log_{\frac{1}{4}} \frac{4}{5} = \log_{\frac{1}{4}} 4 - \log_{\frac{1}{4}} 5$
Power	$\log_b m^p = p \cdot \log_b m$	$\log_2 8^x = x \cdot \log_2 8$
Equality	If $\log_b m = \log_b n,$, then *m* = *n*.	$\log_8(3x-4) = \log_8(5x+2)$ so, 3x – 4 = 5x+2

Limits: Chapter 14

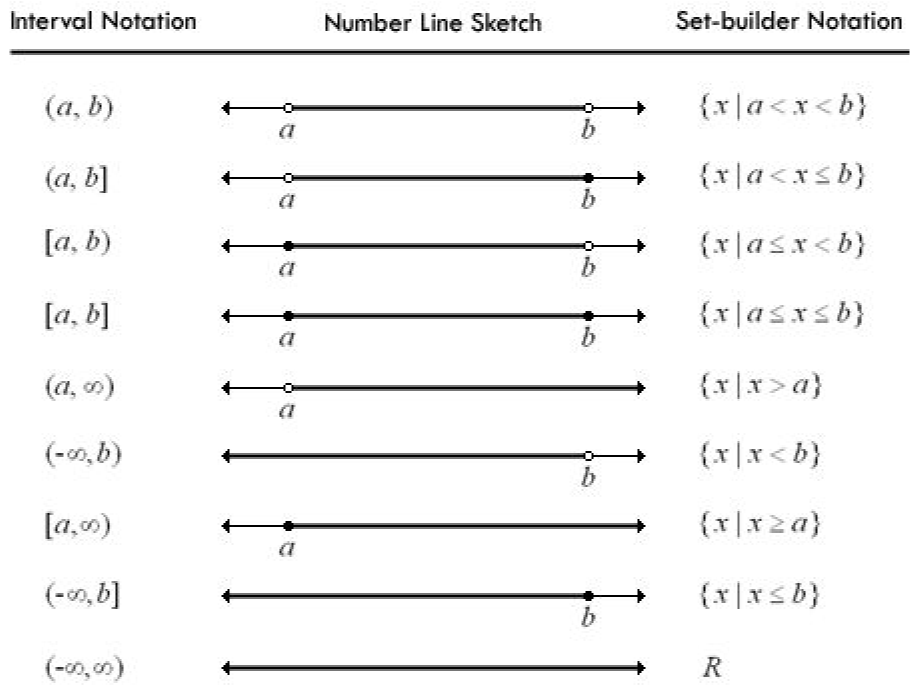
- A function (f) has a limit as x approaches the value a if the limit from the left and right both exist and approach same value; if they don't exist or approach the same value then they DNE
- Algebraic: How to solve
  - o 1. Plug in numbers (if there is a zero in the denominator then factor)
  - o 2. Simplify
- If there is a zero in the denominator, you can also plug in a number (very close number) that is greater and lesser than the number it approaches to determine if it has a +/- infinity or DNE
  - o Same sign = +/- infinity
  - o Different signs: DNE
- MEMORIZE THE AP DEFINITION OF CONTINUITY
- Left hand and right hand limits

$$\lim_{x \to a^+} f(x) = L$$

$$\lim_{x \to a^-} f(x) = L$$

Chapter 15

- o Interval notation:



Interval Notation	Number Line Sketch	Set-builder Notation
(a, b)	a b	$\{x \mid a < x < b\}$
$(a, b]$	a b	$\{x \mid a < x \le b\}$
$[a, b)$	a b	$\{x \mid a \le x < b\}$
$[a, b]$	a b	$\{x \mid a \le x \le b\}$
(a, ∞)	a	$\{x \mid x > a\}$
$(-\infty, b)$	b	$\{x \mid x < b\}$
$[a, \infty)$	a	$\{x \mid x \ge a\}$
$(-\infty, b]$	b	$\{x \mid x \le b\}$
$(-\infty, \infty)$		R

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- Product of linear functions: If a function only changes sign at 0
- Increasing function on an interval (a,b) if every increased input value of x on this interval produce a greater output f(x)
- A function is decreasing function on an interval (a,b) if every greater input value of x on this interval produces a lesser output f(x)
- The value of the function changes sign at each of these zeros and can only do so at zeros.

Problems:

1. Let f(x) = x(x-2)(x+3). Use number line to show the interval on which f is positive and the intervals on which f is negative. Also indicate the values of x for which f is zero.

Chapter 16: Log review

- Refer to chapter 9 notes and textbook
- When solving exponential equations it is necessary to find a way to get rid of the variable out of the exponent
- Problems:
  - o Solve: 2 $log_8 X + log_8 4 = 1$
  - o Solve: -2ln3 – ln(x-1) = -ln1/4 for x
  - o Solve without using logarithms : 8^3x+2=16

Chapter 17: Limits involving Infinity

- Infinity is not a number
- Anything divided by infinity is heading towards zero
- When solving limits with infinity divide bottom and top by the highest and lowest power of x in the denominator

Problems:

1. $lim_{x \to -\infty} (2x - 15x^3)/(14x^2 - 13x)$
2. $lim_{x \to -\infty} (3 - 14x^5 + 2x^3)/(x^4 - x^5 = 1)$

Chapter 19: Tangent lines

- Slope of the curve at point x=a is the slope of the tangent line at x=a
- Slope= derivative
- Derivative notation: f'(x) or dy/dx
- Point: (a,f(a))
- Slope: (f'(a))

Problems:

1. Use graphing calculator to approx. the slope of the graph of f(x) sinx at point (π ,0)
2. Find slope of the line that can be drawn tangent to the graph of f at x=5 given that f(x)=2/x
3. Find the tangent line to f(x)=15-2x^2 at x=1

Chapter 18: Function Composition

1. (f+g) = f(x) + g(x)
2. $(f \cdot g)(x) = f(x) \cdot g(x)$
3. $(f \circ g)(x) = f(g(x))$
4. $(g \circ f)(x) = g(f(x))$

Problems:

1. Using f(x)=x-2 and g(x) = 5x + 3
    a. F(g(2))
    b. G(f(-4))
    c. f(f(1))
    d. f(g(x))

Chapter 24: New notation for Definition of derivative/ Derivative of x^n

- Two types: h instead of change of x
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$$\begin{aligned}\lim_{h\to 0}\frac{f(x+h)-f(x)}{h} &= \lim_{h\to 0}\frac{(x+h)^2-x^2}{h}\\ &= \lim_{h\to 0}\frac{x^2+2xh+h^2-x^2}{h}\\ &= \lim_{h\to 0}\frac{2xh+h^2}{h}\\ &= \lim_{h\to 0}\frac{h(2x+h)}{h}\\ &= \lim_{h\to 0} 2x+h\\ &= 2x\end{aligned}$$

- Get the h out of the denominator so we can let h approach zero
- Use h notation to find answer for the following questions
    - o Find g'(x) given that g(x) = $\sqrt{x}$
    - o Let f(x) = x^2 and define g by g(x) = f(2+x)-f(2)/x
- Power rule:
    - o $$\frac{d}{dx}x^n = nx^{n-1}$$

Problems:

1. Y= 5x^5 -2x^4 -3
2. Y= 2x^3 -4x^2 -4x
3. Y=-3x^4-3x^3-2x