

## Review# 2 - MATH 180-009/013 - FALL 2008

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The second midterm will evaluate material in Chapter 2. Here are the main points.

- Limits and continuity
  - Must be comfortable with the statement:  $\lim_{x \rightarrow a} f(x) = L$  means that as  $x$  gets closer to  $a$ ,  $f(x)$  gets closer to  $L$ .
  - Must be able to compute limits: numerically, using continuity (if  $f$  is continuous at  $a$  then  $\lim_{x \rightarrow a} f(x) = f(a)$ , so we can substitute), or using basic rules (sum, multiplication, quotient).
  - Must be able to identify when limits do NOT exist (limit from the right and from the left don't coincide, function is going to infinity, or oscillating wildly)
  - Must be able to identify when a function is NOT continuous: limit doesn't exist, or it exists but it does not coincide with  $f(a)$ .
- Derivatives
  - Must understand geometric interpretation: slope of the tangent line to the graph is the limit of the slopes of the secants.
  - Must understand interpretation as instantaneous rate of change: limit of average rates of change.
- Calculus of derivatives
  - Must know derivatives of basic functions:  $C$ ,  $x$ ,  $x^n$ ,  $e^x$ ,  $\ln x$ ,  $\sin x$ ,  $\cos x$ .
  - Must know basic rules of differentiation and how to use them to compute derivatives of more complicated functions. (sum rule, product rule, quotient rule, power rule, chain rule, inverse function rule).
- Applications of derivatives
  - Must know how to use information from first and second derivative to graph a function. Must be able:
    - \* to identify intervals of increase/decrease,
    - \* to identify maximums and minimums,
    - \* to identify intervals of convexity (up/down)
    - \* to identify inflexion points
  - Must understand that if the function analyzed is position, then its derivative is the velocity, and its second derivative is acceleration.

Suggested Problems from Supplementary Problems Chapter 2, p. 233-235:  
 3,4,8,12,14,15,16,19,21,24,25,32,34,36.