MATH 132, SEC. 21, FINAL EXAM REVIEW SHEET

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The following is an attempt to summarize the main things we've learned in this class and help you focus on what will most likely appear on the final. This list is not definitive, and I have not seen the final. But, I have a good idea of what will be asked. The following contains a list of types of problems or tricks along with corresponding problems from the book. If I don't list any problems, it is most likely a general concept that arises in a number of sections.

See *http://www.math.msu.edu/CurrentStudents/SampleFinals/Default.aspx* for a sample final.

Things that will probably appear:

(1) Limits
- Taking limits directly, using algebraic manipulation. Tricks to know include
  - Pluggin in (2.2: 1-14)
  - Factoring (2.2: 19-26)
  - Dealing with square roots (multiply by conjugate) (2.2: 27-36)
  - Dealing with piecewise functions or absolute values (write as piecewise function) (2.2: 1-10, 17-18)
  - Functions like $\frac{\sin x}{x}$ (2.4: 21-36)
- Horizontal and vertical assymptotes
  - Finding where they occur
  - Calculating infinite limits, including signs on one-sided limits at VA's. (2.4: 11-16, 37-56) (2.5)
  - Understanding a VA vs. removable discontinuity
- L'Hopital's Rule (4.6: 1-26)

(2) IVT and MTV
- Intermediate Value Theorem (2.6: 45-49)
  - Show a function equals some specified value
  - Solving equations
- Mean Value Theorem
  - Show that the derivative equals some specified value on an interval (4.2:5-10)
  - Word problem like the airplane speeding ticket (4.2:45-50)

(3) Derivatives
- Calculating derivatives using the definition of the derivative $f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$. Use algebraic limit techniques. (3.1:1-12)
- Calculate derivatives using standard rules, such as product, quotient, power, and chain. (3.2:1-38. 3:51-48)
- Derivatives of trig functions (3.4: 1-26)
- Implicit differentiation (3.6:1-44)
- Derivatives of integrals using FTC 1 (5.4: 27-36)

(4) Applications of derivatives
- Position/velocity/acceleration problems (3.3: 1-14)
- Related Rates (3.7)

- Equations of tangent lines (in several areas)
- Linear Approximation (3.8: 1-14, estimating things like $\sqrt{4.02}$)
- Optimization problems (4.1: 55-64) (4.5)
- Finding local extrema and finding absolute extrema on a closed interval (4.1: 15-43). Make sure you know first derivative test.
- Increasing/decreasing, concavity, and graphing functions (4.4: 9-62)

(5) Integrals
- Calculating definite and indefinite integrals
  - Find anti-derivatives of standard functions (4.8:1-53)
  - Substitution (5.5: 1-48; 5.6: 1-24)
  - Compute definite integrals using FTC 2 (5.4: 1-26)
  - Initial value problems (4.8: 67-86; 5.5: 53-60)
  - Area between curves (5.6: 25-70)
- Riemann Sums
  - Use sums to estimate a given integral (with something like $N = 4$). Be able to do left or right endpoints. Also be able to do overestimates and underestimates (for each rectangle, use the lowest or highest point of the curve on the interval). (5.1: 1-9)

Things that will possibly appear:

(1) Limits
- Continuity. Show when a function is continuous, or how you can make a function continuous. (2.6: 13-28, 35-40)
- Oblique assymptotes (2.5: 27-38)

(2) Derivatives & Applications
- Slope of curve defined by parametric equations (3.5:87-94)
- Newton's method (4.7: 1-6)

(3) Integrals
- Definite integral via the definition
- Average values

Things which you shouldn't worry about:

(1) Actual definition of limit involving δ and ϵ
(2) Trig identites
(3) Specific volume formulas other than rectangular solids.
(4) Formulas for the sums $\sum_{k=1}^{n} k, \sum_{k=1}^{n} k^2, \sum_{k=1}^{n} k^3$.