Topics for the Analysis 1A Final Exam

Limits

[1] Section 2.2 from textbook: Definition of a limit, computations of simple limits, limits from the left and from the right

[2] epsilon, delta proofs for linear functions

[3] Section 2.3 from textbook: Limit Laws (page 79-81), indeterminate forms

[4] Demonstrating Limits by algebra techniques, graphing, etc.

[5] The Squeeze Theorem

[6] lim as x--> 0 [sinx/x] = 1 and other trigonometric limits

[7] Section 2.4 from textbook Def of continuity at a point, continuity on an open/closed interval

[8] The Intermediate Value Theorem

[9] Section 2.5: Infinite Limits, Section 4.5: Limits at Infinity -- formal definitions of these limits

[10] Formal definition of horizontal/vertical asymptotes

Catch-All
- Everything from Limits Review WS I, II, and III
- Everything from "Review Packet for First Limits Test"
- Everything from "More Review for Limits Test"
- Understanding concepts on Limit of the Product of Two Functions handout

Good Review Problems:

Anything from the Review Exercises for Chapter 2 (pages 111-112) and, since those are kind of easy, #6 and #7 from page 113-114.

Differentiation

[1] Sections 3.1 -- Definition of the derivative at a point (both versions), definition of the derivative function, derivative as the slope of the tangent line, and derivative as the rate of change.

- Computing a derivative function using the definition (p. 124 #11-24)
- Proving that a function is not diff at a particular point (p. 126 #75, 77, 91-94)
- Finding equations of tangent lines (p. 124 #25-36)
- Evaluating a limit by interpreting it as a derivative (p. 125 #49-52)

[2] Section 3.2 -- Power rule, derivatives of sin, cos, e^x
- problems like p. 137 #63-66, 73, 77-78
- problems like p. 139 #113-114

[3] Section 3.3 -- Product rule, reciprocal rule, quotient rule, derivatives of sec, csc, cot, and tan, 2nd/3rd derivatives, etc.
- problems like p. 148 #85-86, #111-114
- problems lik p. 150 #139

[4] Section 3.4 - Chain Rule, derivative of ln(x), ln(|x|), a^x, log_base a_(x)
- problems like p. 161 #9-35, 55-137
- problems like p. 164 #153, 154
- see answer key to the "Differentiation Practice" WS in the Unit 2 folder

[5] Sketching der
ivatives based on the graph of f
- see answer key to Sketching Derivatives WS in the Unit 2 folder

[6] Section 3.5 - Implicit Differentiation, finding the slope/equation of the tangent line to a curve defined implicitly, fnding the second derivative implicitly, logarithmic differentiation
- problems like p. 171 #1-20, 25-46, 51-56, 63-64, 92-94
- problems like p. 173 #65-74
- see answer key to "Implicit Differentiation Practice" packet in the Unit 2 folder

[7] Section 3.6 - Derivatives of Inverse Trig Functions
- problems like p. 180 #19-52, 57-60
- see
answer key in Unit 2 folder

[8] Section 3.7 - Related Rates
- see answer key in the unit 3 folder
- sample problems: p. 200 #145-147

[9] Section 4.1 - Finding Extrema on a closed interval
- problems like p. 209 #21-38

[10] Section 4.2 -- Rolle's Theorem, Mean Value Theorem
- problems: like p. 216 #18, 19, 37, 44, 45, 47, 65, 71

[11] Section 4.3 -- Increasing / Decreasing Functions and the FDT
- problems like: p. 226 #19, 27, 29, 41, 43, 52, 53, 71,

Applications of Differentiation

[2] Section 4.4 -- Concavity, points of inflection, 2nd derivative test

Sample problems: p. 235 #13, 17, 26, 27, 41, 49, 70

[3] Section 4.6 -- Curve Sketching

Sample problems: all the examples from the textbook in 4.6

See also: App of Diff packet pages 1-3 ans key in Unit 3 folder

[4] Section 4.7 -- Optimization

Sample problems: p. 267 #39, 49

See also: App of Diff packet pages 4-6 ans key in Unit 3 folder

[5] Rectilinear Motion

See: App of Diff packet pages 7-12 ans key in Unit 3 folder

[6] Linearization / Differentials -- section 4.8

Sample problems: p. 277 #33, 47

[7] Newton's Method -- section 3.8

Sample problem: p. 195 #5

[8] Calculus of Parametric Curves -- section 10.3 (only to mid of p. 721)

Sample problems: p. 725 #11, 15, 29, 37
See also: answer key to Motion in the Plane WS in Unit 3 folder

Anti-differentiation

[1] Basic Antidifferentiation: See examples 2-6 of section 5.1

[2] Solving initial Condition Problems: see page 289 and p. 293 #69

[3] Antidifferentiation with Substitution -- section 5.5

[4] Antidifferentiation with Logarithms -- section 5.7

[5] Antidifferentiation with Inverse Trig -- section 5.8

To study:

- Do some of page 380 #15, 63-80, 97-100, 107-114

Integration

[6] Computing area under a curve by summing n rectangles and taking a limit (section 5.2) examples: p. 300-302 Examples 4, 5, and 6 // p. 305 #47-56

[7] Riemann Sums – section 5.3: definition of a Riemann Sum, partitions, sample points, definition of an integral, properties of integral: examples p. 314 #15-50. Also: looking at a Riemann Sum and recognizing the integral: p. 314 #9-14

[8] LRAM, RRAM, Midpoint Rule, Minimum, Maximum, Trapezoid Rule, and which are underestimates and which are overestimates

[9] Computing integrals without using the fundamental theorem of calculus (using geometry).

[10] WS entitled: Practice with Integration – problems like that

[11] The fundamental theorem of calculus (section 5.4), including:

Accumulator functions – see worksheet and p. 329 #85-86
Mean Value theorem for integrals, average value of a function examples: p. 327 #51-62

[12] Integration (sections 5.5, 5.7, 5.8) – Applying the FTC 2 to compute integrals: Examples: p. 341 #95-112 // p. 359 #49-56 // p. 366 #21-30

[14] Interpretation of the Integral as the Net Change, including distance vs. displacement

[15] AP-style FTC problems

You should be able to do every single problem on p. 380-382 #1-113
Plan for Study:
- Do Review Packet for Test on Integration and check answer key on Edline
- Do Riemann Sums and Integrals packet and check answer key on Edline
- Do shoveling snow and processing gravel AP Practice problems
- Check answer key to "AP Problems on the FTC" packet
- Do practice problems from the textbook on p. 380-382
- Bring a TI-83/84 calculator. There will be a short calculator portion of this test

Applications of Integration

[1] Area between two curves

page 452 #13, 55, 69, 75, 77, 93

[2] Volume by Discs/Washers

page 463 # 21, 32, 39, 51, 67-74

[3] Volume by Cross Sections

Page 463 #61 & WS on Cross Sections

[4] Volume by Shells

page 473 #41, 47-51, 54, 59

[5] Numerical Integration
- using your calculuator to compute L_n, R_n, T_n, M_n
- knowing which of L_n, R_n, T_n, M_n is an upper or lower estimate based on whether the function is increasing/decreasing or concave up/down
- finding upper bounds on the error produced using these methods
- how many subintervals do I need to get within a certain amount of error?

Theorems that you should know and understand and be able to name

- Definition of Limit (epsilon, delta, etc.)

- Squeeze Theorem

- Definition of Continuity

- Definition of Derivative at a point

- Definition of the Derivative function

- Intermediate Value Theorem

- Extreme Value Theorem

- Rolle's Theorem

- Mean Value Theorem

- First Derivative Test

- Second Derivative Test

- A curve that is concave up on an interval lies below the secant line and above the tangent line

- Definition of the Integral

- Mean Value Theorem for Integrals

- Fundamental Theorem of Calculus (parts 1 and 2)

Plan for Study

[1] Do review packet (check answer key on Edline)

[2] Review (rederive) differentiation and integration formulas

[3] Review tests from the semester

[4] Do some problems from the book, if necessary