Review Sheet for the Final Exam (Chapters 6, 7, 8, and 9, and Sections 10.5 and 10.7) Math 1220–7

Section 6.1

- Be able to take the derivative of the natural logarithm function.
- Be able to integrate functions of the form $f'(x)/f(x)$.
- Know the following properties of natural logarithms: $\ln 1 = 0$, $\ln ab = \ln a + \ln b$, $\ln \frac{a}{b} = \ln a - \ln b$, and $\ln a^r = r \ln a$.
- Be able to use logarithmic differentiation to differentiate other functions (such as products, fractions, and radicals).
- **Practice Problems:** 6.1 #1–33 odds

Section 6.2

- This section focused on finding and using inverse functions, which will not be covered on the final exam.
- **Practice Problems:** None

Section 6.3

- Know the relationship between the functions $f(x) = \ln x$ and $g(x) = e^x$.
- Be able to differentiate and integrate exponential functions.
- **Practice Problems:** 6.3 #3–21 odds, 37–43 odds

Section 6.4

- Know properties of exponents in the table on page 342 of your textbook. ($a^x a^y = a^{x+y}$, etc.)
- Be able to differentiate and integrate exponential functions of base $a > 0$, $a \neq 1$.
- Be able to differentiate logarithmic functions of base $a > 0$, $a \neq 1$.
- **Practice Problems:** 6.4 #17–33 odds

Section 6.5

- Be able to use the limit $\lim_{h \to 0}(1 + h)^{1/h} = e$.
- This section focused on exponential grown and decay, which will not be focused on for the final exam. Practice problems #1 and 3 are listed in case you feel that you need extra practice with integration.
- **Practice Problems:** 6.5 #1, 3, 37

Section 6.6

- Be able to recognize and solve first-order linear differential equations (of the form $\frac{dy}{dx} + P(x)y = Q(x)$), remembering to use the integrating factor $\exp(\int P(x)\,dx)$.
- Kirchhoff's Law was also covered, but will not be on the final exam.
- **Practice Problems:** 6.6 #1–13 odds

Section 6.7

- Be able to use Euler's Method to approximate solutions to differential equations.
- Slope fields were also covered, but will not be on the final exam.
- **Practice Problems:** 6.7 #11–15 odds

Section 6.8

- Know the derivatives of all trigonometric functions.
- Be able to evaluate inverse trigonometric functions.
- Know how to find the derivatives of inverse trigonometric functions.
- Be able to integrate functions whose integrals are inverse trigonometric functions.
- **Practice Problems:** 6.8 #1–9 odds, 39–71 odds

Section 6.9

- Know the definitions of the hyperbolic functions, especially sinh and cosh.
- Be able to differentiate hyperbolic functions, as well as integrate $\sinh x$ and $\cosh x$.
- **Practice Problems:** 6.9 #13–45 odds

Section 7.1

- This section was a review of integration techniques seen so far in Calculus (u-substitution, power rule, etc.)
- **Practice Problems:** 7.1 #1–53 odds

Section 7.2

- Know and be able to use the integration by parts formula.
- Be able to use the integration by parts formula to be able to integrate functions like $\ln x$ and $\arctan x$.
- **Practice Problems:** 7.2 #1–45 odds

Section 7.3

- Be able to evaluate integrals involving $\sin x$ and/or $\cos x$ raised to powers large than 1.
- Integrals involving powers of tangent and cotangent, as well as $\sin mx \cos nx$, $\sin mx \sin nx$, and $\cos mx \cos nx$ where $m \neq n$ will not be on the final exam.
- **Practice Problems:** 7.3 #1–11 odds, 15

Section 7.4

- Be able to integrate functions involving radicals by recognizing which substitution is most useful.
- **Practice Problems:** 7.4 #1–15 odds

Section 7.5

- Be able to carry out partial fraction decomposition in order to integrate rational functions.
- **Practice Problems:** 7.5 #1–15 odds

Section 7.6

- This section was primarily intended for review.
- **Practice Problems:** 7.6 #1–29 odds (Note: Some of these may involve inverse hyperbolic functions, which will not be on the final exam.)

Section 8.1

- Know how to use l'Hôpital's Rule for indeterminate forms of the type $0/0$.
- **Practice Problems:** 8.1 #1–21 odds

Section 8.2

- Know how to use l'Hôpital's Rule for indeterminate forms of the type ∞/∞.
- Be able to transform indeterminate forms of the type $0 \cdot \infty$, $\infty - \infty$, 0^0, ∞^0, and 1^∞ into a fraction where l'Hôpital's Rule will apply.
- **Practice Problems:** 8.2 #1–39 odds

Section 8.3

- Be able to evaluate definite integrals with one or two infinite limits of integration if they converge, and recognize when the integral diverges.
- **Practice Problems:** 8.3 #1–19 odds

Section 8.4

- Know how to evaluate definite integrals with infinite integrands if they converge, and recognize when the integral diverges.
- **Practice Problems:** 8.4 #1–31 odds

Section 9.1

- Recognize sequence notation and be able to write the first few terms of a sequence when a formula is given.
- Be able to write an explicit formula for the terms in a sequence when the terms are given.
- Know how to determine whether a sequence converges or diverges. If it converges, be able to find the limit of the sequence.
- **Practice Problems:** 9.1 #1–35 odds

Section 9.2

- Be able to recognize a series.
- Know how to tell when a geometric series converges or diverges. In the convergent case, be able to use the formula to find the sum of the series.
- Know how to use the n^{th}-Term Test for Divergence.
- Be able to recognize the harmonic series and know that it diverges.
- Be able to use the linearity of convergent series properties found on page 459 of the book.
- **Practice Problems:** 9.2 #1–13 odds, 21, 23 (Note: On the exam, you can use any appropriate method to determine whether a series converges or diverges, so you can choose to approach these problems with a test from a future section.)

Section 9.3

- For positive series, be able to use the integral test.
- Know how to recognize when a p-series test is useful (It can save time over the integral test, but you can use the integral test if you prefer.).
- **Practice Problems:** 9.3 #1–21 odds

Section 9.4

- Know how to use the Ordinary Comparison Test and Limit Comparison Test for positive series.
- For positive series, know the Ratio Test.
- **Practice Problems:** 9.4 #1–33 odds

Section 9.5

- Be able to recognize an alternating series, and know when the Alternating Series Test says that it converges.
- Know the definitions of and differences between absolute convergence, conditional convergence, and divergence.
- Know how to use the Absolute Ratio Test.
- **Practice Problems:** 9.5 #7–29 odds

Section 9.6

- Be able to recognize a power series in either x or $x - a$.
- Know how to find the convergence set and radius of convergence for a power series.
- **Practice Problems:** 9.6 #1–27 odds

Section 9.7

- Be able to differentiate and integrate a power series term-by-term.
- Know how to add, subtract, multiply, and divide power series.
- **Practice Problems:** 9.7 #1–9 odds, 13–23 odds

Section 9.8

- Be able to calculate Taylor and Maclaurin Series for a given function.
- Know how to use operations (such as addition, subtraction, multiplication, and division) to help find the series representation of a function when it's useful.
- **Practice Problems:** 9.8 #1–23 odds, 27

Section 9.9

- Be able to find Taylor and Maclaurin Polynomials of order n for a given function.
- **Practice Problems:** 9.9 #1–15 odds

Section 10.5

- Know how to convert between Polar and Rectangular (Cartesian) coordinates.
- Be able to recognize and graph equations of lines and circles.
- **Practice Problems:** 10.5 #5, 7, 9, 11–35 odds (Note: Some of these may be the graphs of Conics, which will not be on the final exam)

Section 10.7

- Be able to find the area of the region bounded by a given polar curve.
- **Practice Problems:** 10.7 #1–13 odds (Note: Don't worry about sketching the graphs.)