Math 5A **Final Exam Prep**

Note: If you received at least 90% on your homework you can rework Exam 4. Reworks are due at the Final Exam

General Info

The Final Exam is scheduled for **Tuesday, Dec 15 from 7pm to 9:50pm**. It will cover material from Chapters 1 through 5. Specifically only those sections we covered throughout the semester. There are 22 problems on the exam (a few of which have multiple parts. The exam is closed book/notes. You may use a calculator as long as it isn't a TI-89 or any other calculator that does algebraic manipulation. You may use the entire class to do the exam. To receive full credit you must show your work.

Chapter 1

Chapter 1 skills are incorporated into the problems on the exam. From Chapter 1 material, you should know how to:

1) Graph any transformation into the problems on the exam (for example Exam 4, Problem 5, part c).
2) Solve simple trigonometric equations (e.g. $\cos x = 0.5$).
3) Factor. Don't forget about: grouping, difference of squares, sum of cubes and difference of cubes (see notes).
4) Simplify complex fractions (see notes, various problems in exams, limit definition of derivative of rational function)
5) Rationalize a numerator or denominator by using a conjugate.
6) Use right triangular trigonometry (e.g. E.C. Problem 11 on Exam 4)
7) Use the fundamental trigonometric identities (spec. double angle, power reduction and fundamental identities)
8) Use Pythagorean Theorem (trig, distance formula, etc.)
9) Find the Volume of a sphere, cone, cylinder or rectangular solid
10) Find the area of a rectangle, triangle or circle.
11) Find the equation of a line (for instance...of a tangent line).

Chapter 2

From Chapter 2, you should know or know how to apply the following:

1) The Limit Laws
2) A function f is **continuous** at a number a if $\lim_{x\to a} f(x) = f(a)$ which is proved by showing:
   (A) $f(a)$ is defined,
   (B) $\lim_{x\to a} f(x)$ exists (left- and right-hand limits exist and are equal),
   (C) $\lim_{x\to a} f(x) = f(a)$
3) Limit Definition of a derivative: $\lim_{h\to 0} \dfrac{f(x+h)-f(x)}{h}$
4) A function f is **differentiable** at a number a if $f'(a)$ exists. A function f will NOT be differentiable at the following:
   (A) "kink" or "corners" in the graph, where the rate of change of f changes abruptly.
   (B) points of discontinuity
   (C) vertical tangents

Chapter 3

From Chapter 3 you should know or know how to apply the following:

1) Sum, difference, product and quotient rules for differentiation.
2) Chain rule for differentiation.
3) The derivatives of polynomial, rational, exponential (with any base), logarithmic (with any base), trigonometric and inverse trigonometric, hyperbolic sine and hyperbolic cosine functions.
4) Implicit Differentiation
5) Logarithmic Differentiation

Chapter 4

From Chapter 4 you should know or know how to apply the following:

1) Increasing/Decreasing Test.
2) First Derivative Test for finding extrema.
3) Concavity Test
4) The Second Derivative Test
5) L'Hospital's Rule

Chapter 5

From Chapter 5 you should be able to work the type of problems below, which include memorizing and knowing how to apply the following:

1) The area A under a graph of a continuous function f is the limit of the sum of the areas of approximating rectangles.

2) Theorem 4 in Section 5.2 – If f is integrable on $[a,b]$, then

$$\int_a^b f(x)\,dx = \lim_{n\to\infty}\sum_{i=1}^{n} f(x_i)\,\Delta x\,, \qquad \text{where} \quad \Delta x = \frac{b-a}{n} \qquad \text{and} \qquad x_i = a + i\cdot\Delta x$$

3) Summation Properties and $\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$. Other summation formulas will be provided.

4) Properties of Integrals
5) The Fundamental Theorem of Calculus
6) Table of Indefinite Integrals.
7) The Net Change Theorem
8) Integrals of Symmetric Functions
9) Substitution Rule for both indefinite and definite integrals

Final Exam Directions

Problems 1 through 4: Use algebraic/computational techniques (not tables) to find the exact value of the following limit, if it exists. State what each limit means graphically. *The limits given may be of an indeterminate form. You may have to change it's form, use a logarithmic and/or use l'Hospital's Rule. You may have to factor, use a conjugate to rationalize the numerator, divide by the highest power of x, use the fact that* $\sqrt{x^2} = |x|$*, know the piecewise definition of* $|x|$

Problem 5: Use the given graph of f to answer the questions about limits, continuity and differentiability.

Problem 6: Use the **definition of the derivative** of a function to find f' for some given function f

Problem 7: Sketch a graph of a function that satisfies all of the given conditions. *Given conditions will include information about first and second derivatives, function values and limits.*

Problem 8 through 10: Find y'. *The functions given will be compositions of polynomial, rational, exponential, logarithmic, trigonometric, inverse trigonometric, hyperbolic sine, and hyperbolic cosine functions. You may need to use any of the differentiation rules and/or logarithmic differentiation.*

Problem 11: Find an equation of the tangent line and of the normal line to the curve at the given point. *A specific **implicitly**-defined function and a point will be given.*

Problem 12: Related Rates Problem

Problem 13: The graph of the first derivative, f', of a continuous function f is shown.

a) State the intervals on which f is increasing (or decreasing).
b) At what values of x does f have a local maximum or a local minimum?
c) On what intervals is f concave up or concave down?
d) What are the f-coordinates of the inflection points of f ?
e) Sketch a possible graph of f.

Problems 14–22 on the next page….

Problem 14:	Optimization Problem…
Problem 15:	Use the form of the **definition of the integral** in Theorem 4 from Section 5.2 to set up and evaluate the integral using a limit of a Riemann Sum
Problem 16:	Sketch a graph of the piecewise-defined function and then evaluate the integral by using properties of integrals and interpreting it with areas of geometric shapes.
Problem 17 and 18:	Evaluate the integral. *You will be given integrals that may or may not need a u-substitution.*
Problems 19 and 20:	Find a general form of the indefinite integral.
Problem 21:	The velocity function is given for a particle moving along a line. a) When is the particle moving left? When is it moving right? b) Draw a diagram illustrating the particle's position. Label at least three times(& position) c) Find the displacement during the given time period d) Find the total distance traveled during the given time period.
Problem 22:	Circle **T** if the statement is true or **F** if the statement is false.

Redo the problems from previous reviews (below) and your Exams, with directions that are similar to the questions listed above.

Review Problems assigned from Previous Reviews

Chapter 2 Review Problems

True/False Quiz	Page 166	Problems 1–11 all, 13, 17
Exercises	Page 167–168	Problems 1–22 all, 29, 30, 35–37all, 39ab, 42–44 all, 45ab, 47

Chapter 3 Review Problems

True/False Quiz	Page 261	Problems 1–12 all
Exercises	Page 262–264	Problems 1–39 odd, 43, 45, 49, 57–61 all, 63, 65, 66, 70, 71–78 all, 84, 89, 97, 98, 99, 101–105 all

Chapter 4 Review Problems

True/False Quiz	Page 261	Problems 1–10 all, 18–20 all
Exercises	Page 262–264	Problems 1–5 odd, 7–18 all, 19, 25, 27, 33, 47, 53, 58, 61, 65–75 odd

Chapter 5 Review Problems

True/False Quiz	Page 409	Problems 1–6 all, 9–15 all
Exercises	Page 409–411	Problems 3, 9–35 odd, 56, 57