Math 171-01
Final Exam Information

The 1st final exam is Thursday, December 2, during class. The 2nd final exam is Wednesday, December 15, 1pm–2:50pm, in Room 2625. Special office hours during finals week:

- Monday, December 13: 2:00pm – 5:00pm
- Tuesday, December 14: 12:00pm – 2:00pm
- Wednesday, December 15: 12:00pm – 1:00pm

Skills Checklist

1. Find the equation of a line (especially a tangent line).
2. Compute limits by substitution. For example, $\lim_{x\to 3}(x^2 - 5x + 1)$.
3. Know what to do with limits of the form $\frac{0}{0}$. For example, $\lim_{x\to 1} \frac{x^2-1}{x-1}$
4. Know how to use $\lim_{x\to 0} \frac{\sin x}{x} = 1$. For example, $\lim_{x\to 0} \frac{\sin 5x}{\sin 3x}$.
5. Use the Sandwich Theorem to find limits.
6. Find out if an infinite limit is $+\infty$ or $-\infty$.
7. Test for continuity (especially in piecewise defined functions).
8. Compute a derivative from the definition. $f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$
9. Apply standard differentiation rules, including the chain rule for compositions of functions.
10. Know how to derive the differentiation formulas for the trig functions.
11. Solve problems involving position, velocity, and acceleration. Know the difference between average velocity and instantaneous velocity.
12. Compute derivatives of implicitly defined functions.
13. Set up and work out a straight forward related rate problem.
14. Find the absolute extrema of continuous functions on closed and bounded intervals.
15. Be able to state and explain Rolle's Theorem and the Mean Value Theorem.
16. Apply the first derivative test to determine intervals on which a function is increasing/decreasing.
17. Apply the second derivative test to determine intervals on which a function's graph is concave up/down.
18. Find all asymptotes (vertical, horizontal, oblique) of the graph of a function.

19. Set up and work out a straight forward optimization problem.

20. Compute differentials. $dy = f'(x)dx$

21. Use Newton's Method $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$ to approximate solutions of $f(x) = 0$.

22. Apply standard antidifferentiation rules to evaluate indefinite integrals. Do not forget to include $+C$ with your antiderivatives.

23. Understand the relationship between $\int_a^b f(x)dx$ and the area of the region under the graph of f.

24. Use Riemann sums to approximate definite integrals. For example, compute the Riemann sum using right endpoints for the function $f(x) = x^3$ on the interval [0,1] when four subintervals are used.

25. Compute the average value of a function. Avg Value $= \frac{1}{b-a}\int_a^b f(x)dx$

26. Know the basic properties of definite integrals.

27. Use the Fundamental Theorem of Calculus to compute $\int_a^b f(x)dx$.

28. Use substitution to evaluate definite and indefinite integrals.

29. Find the area between two curves.

30. Approximate definite integrals using the Trapezoidal rule: $T = \frac{h}{2}(f(x_0) + 2f(x_1) + \cdots + 2f(x_{n-1}) + f(x_n))$.

In addition to everything listed above, the second final exam will also cover the following skills.

1. Approximate definite integrals using Simpson's rule: $S = \frac{h}{3}(f(x_0) + 4f(x_1) + 2f(x_2) + \cdots + 2f(x_{n_2}) + 4f(x_{n-1}) + f(x_n))$.

2. Use the disk/washer method to find the volume of a solid of revolution.

3. Use the Fundamental Theorem of Calculus to compute $\frac{d}{dx}\int_a^{g(x)} f(t)dt = f(g(x)) \cdot g'(x)$.