Math 175 Final Review

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The final exam for our section of Math 175 is Thursday, May 15, 10:30 am–12:30 pm. It is my usual custom to extend this 15 minutes, which would take us to 12:45 pm, unless someone objects...

The length of the exam should resemble the lengths of the sample exams, which look quite satisfactory to me. Obviously topics we have not covered (polar coordinates, Euler's method) will not be on this test. There *will* be an applied problem from section 6.6 (work) on this final, which doesn't seem to be the case on the sample finals.

There is an enormous amount of material here: of course not everything will be covered. There will be questions that incorporate material from more than one section. There will be questions with built-in makeup effects on designated questions on earlier tests.

Nothing I say here is a promise as to what might appear as an A/B separator on the final. I might ask about anything at all if something clever occurs to me along these lines. Anything of this kind will be no more than a part of a numbered question. I don't usually take advantage of this...

I will be available in regular office hours and extended hours I am holding 3-5 pm or so in MG122 for my other class but which you are welcome to visit Monday, Tuesday and Wednesday next week. I make no promises of availability on Thursday itself.

5.6: Areas between curves are likely to be covered. There will be no direct question about integration by substitution, but of course there will be opportunities to use this technique, and you should show your work when you use it.

6.1, 6.2: Volume of solids of revolution, determined by either the method of disks and washers or the method of cylindrical shells, will be on the

exam. Some question or part of a question may ask for setup only, but you should be ready to do a complete problem all the way to evaluation of the integral.

6.3, 6.4: I am more likely to ask for setup on a problem of this kind. I will probably ask either a 6.3 or a 6.4 question and unless it comes out remarkably nicely I am likely to ask for setup only.

6.5: I might ask for an exponential growth and decay problem as an alternative to the applied question from 6.6; in any event there will be no required problem of this kind. I very well might ask you to solve a separable differential equation, so review that part of this section.

6.6: The department outcomes assessment program requires me to put an applied problem on the final. My focus for this problem is section 6.6 (work problems). Problems 13-21 in section 6.6 are models for the kinds of questions I like. I'm planning to include two or three alternative applied problems: it occurs to me that one of these could be a 6.5 exponential growth and decay problem. I will not ask any questions from 6.7 on this exam.

7.1: Integration by parts. Be able to do it. Show all details (u, v, du, dv). An integration by parts might be embedded in another problem (such as the 7.7 or even 8.3 problem).

7.2: Trigonometric integrals. Be able to do them. I suggest in particular that you study examples 1 and 2 in the section (pp. 456-7) and similar homework problems. Evaluation of trigonometric integrals is important for 7.3. Of course you should know how to integrate $\sin^2(x)$ and $\cos^2(x)$ and show details of how it is done.

7.3: Trigonometric substitution. Just as in the section and on two earlier tests. You should be able to identify the appropriate substitution to make and carry it out all the way to evaluation of the integral.

7.4: Integration by partial fractions. This will be confined to relatively simple examples.

techniques of integration in general: There are a lot of techniques here. Some of them may be folded into other questions.

7.6: Expect a question very much like the questions on the previous test: give an estimate with a small number of partitions and possibly determine how many partitions would be needed for a given degree of accuracy (or determine a bound on the error in the estimate you actually compute).

7.7: Be able to compute improper integrals. A natural place to ask you to compute an improper integral is in a question on section 8.3 (the integral test).

8.1: I will not ask anything directly about section 8.1. Of course, you may have to compute limits of sequences to support other chapter 8 work.

8.2: Be able to compute the values of infinite geometric series. Be able to recognize them. Be able to write a geometric series for a function like $\frac{1}{1+x^2}$ which matches the formula $\frac{a}{1-r}$ for the sum of an infinite geometric series. For any infinite geometric series, be able to tell whether it converges or diverges. Notice that repeating decimals are examples of infinite geometric series!

8.3: Be able to determine whether an infinite series converges or not using the Integral Test. Do be ready to state the conditions on a function which allow the Integral Test to be applied (I didn't ask for this on Test IV and I should have...). This question is a natural point for me to ask you to apply techniques from 7.7 and even from 7.1 or 7.4 (depending on what techniques of integration are needed).

8.4: Comparison Tests. Be able to do them and be able to state clearly all the facts you are using.

8.5: Ratio and Root Tests. Be able to apply them. These might naturally be applied to power series, in the context of 8.7 or 8.8. Notice that this is where 8.1 comes in: though I will not directly ask about sequences, you will need to set up and evaluate limits of sequences to apply these tests.

8.6: Alternating series. Be able to state clearly the conditions on a function which make the Alternating Series Test apply to a series developed using that function. Do not copy the conditions from the theorem: state them for the function you are actually using. Be able to use error estimation techniques for alternating series.

8.7: Be able to develop series for familiar functions by reverse engineering from geometric series and then using integration or differentiation (as in problem 5 on Test IV). Be able to determine the radius and interval of convergence of a power series (don't forget to check the endpoints!)

8.8: Be able to develop the Maclaurin series for a function using the techniques explained in class (problem 6, Test IV).

8.9: Be able to develop Taylor series for functions using Taylor series for functions like e^x, $\cos(x)$, $\sin(x)$ and the ones we can get from geometric series. Techniques include addition, subtraction, multiplication, substitution for x, integration and differentiation.

Be able to do problems like 25 or 27 in this section. I will ask you to write the first few terms of series (not a general formula) and estimation will be using the alternating series estimation formula.

Taylor remainders will not appear.

8.10 Be able to apply the binomial series expansion. It is just a special case of 8.8. Use the table in this section to review the power series you are supposed to know.