Review for Final Exam

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1 General Remarks

This is a retread of the review sheet I used in fall 2001; I have tried to change all references to the book to agree with the current edition, and I have tried to eliminate statements appropriate in 2001 but not in 2003, but there might still be mistakes of this kind.

The exam will be on Wednesday at 8:00 am in this room. If everyone agrees, the exam will be extended to end at 10:15 am.

You will be permitted to use any calculator (cell phones and palmtop computers are still not permitted because they have inappropriate communication capabilities). The exam will be open book, open notes (closed neighbor, as usual). Because of the permitted calculator use, be sure to pay attention to instructions: in some problems I may insist that you show work or that you give exact answers rather than calculator approximations. When you use your calculator, be sure to show all set-up and sketch any graphs you use.

Review materials include the past final I posted on the web yesterday and the solution sets for previous exams.

Ideally the exam would be about the same length as one of our earlier exams, but it will unavoidably be somewhat longer. I will feel free to ask questions which test more than one topic at the same time (this can help with length but may require more thought on your part).

Nothing I say in this document in any way restricts what I may ask in the hardest question on the exam. In general, this review comes with no guarantee; if I find that I have missed something that I obviously should

cover, I will not feel constrained to leave it out. It is also the case that I may specifically tell you to study topics which will not appear on the exam at all!

If you have never taken an open-book exam before, be aware that my experience indicates that it is still very much necessary to study!!!

2 Remarks on Individual Chapters

Chapter 2: Be familiar with the vertical line test for functions and with the horizontal line test for functions with inverses.

I will ask you to determine the domain of one or more functions. The functions might involve the logarithm function.

Understand the notation for piecewise defined functions.

Section 2.3 will not be on the final; the notion of average rate of change in section 2.4 might appear on the final.

If I ask about section 2.5 (transformations of functions), I am likely to ask a matching question.

There will definitely be a word problem from section 2.7 (max/min problems involving finding the vertex of the graph of a quadratic function). There may be a max/min word problem requiring the use of your graphing calculator. (see for example problem 31, page 217).

There will be probably be some kind of question about composition of functions (section 2.8). A graphical question, like problems 23-28 on page 225, might appear.

For section 2.9 (inverse functions) you should understand how to compute an inverse function, how to recognize when one does not exist (horizontal line test), and you should know the geometrical relationship between the graph of a function and the graph of its inverse.

Chapter 3: In section 3.1, you should be able to draw conclusions about a polynomial from the shape of its graph. This includes whether its degree is even or odd, what the sign of its leading coefficient may be, and the relationship between the number of local maxima and minima and the minimum possible degree.

You should understand the relation between zeroes of a polynomial, x-intercepts of its graph, and linear factors of the polynomial.

You should be able to use synthetic division to factor polynomials and to find values of polynomials at particular values of x. Synthetic division is the only polynomial division I will ask about. I might ask you to use synthetic division to rewrite a rational function.

I will probably test your knowledge of the remainder theorem, factor theorem and rational roots theorem. I will not ask about the upper and lower bounds theorem or Descartes's rule of signs.

You will be asked to carry out arithmetic operations on complex numbers. You will be asked to convert complex numbers to trigonometric form and you may be asked to use trigonometric form to multiply or divide complex numbers. You may be called upon to find complex roots of polynomials.

You will be asked to graph a rational function. You may be asked to determine a rational function given its graph (I did this on one of the exams).

Chapter 4: The emphasis in this chapter will be on two specific topics:

I will ask about exponential growth and decay (including compound interest problems; section 4.5)

and I will test your knowledge of the laws of logarithms (section 4.3).

Chapters 5 and 6: Understand the definitions of the trigonometric functions, both in terms of right triangles and in terms of the unit circle.

Be able to compute all trigonometric functions of an angle given the value of one function and the quadrant in which the angle is found. Be able to do the same for twice the angle or half the angle (section 7.3).

Be familiar with fundamental trigonometric identities and with the commonly used exact values of trigonometric functions.

Be able to convert between degrees and radians, especially at familiar angles. Your calculator should be in degree mode; problems involving calculator use will always involve degrees.

Be able to deal with trigonometric graphs (sine and cosine only). Be able to determine a trigonometric function involving sine or cosine given its graph (section 5.3).

Be able to solve triangles using the Laws of Sines and Cosines. Don't forget the ambiguous case of the Law of Sines! You will be asked to do a word problem involving the Law of Sines and/or the Law of Cosines.

Chapter 7: Be able to verify trigonometric identities. Your performance on test 4 was encouraging.

Be able to use the addition and subtraction formulas for sine and cosine to verify identities or to compute specific exact values of trigonometric functions.

Ditto for the formulas in section 7.3.

In section 7.4, I like problems like 29-36, p. 567.

I have already alluded to section 7.6 above in relation to computations with complex numbers.

In section 7.5, I may ask you to solve a simple equation like $\sin(3x) = \frac{1}{2}$, giving all solutions in the interval $[0, 2\pi)$.

In section 7.7, be able to do computations with pictured vectors. Be able to convert vectors between magnitude/direction form and coordinate form. I might or might not give a word problem from this section.

Chapter 8: I will ask you to solve a system of three equations in three unknowns showing all work (row operations) or I will ask you to compute the inverse of a three by three matrix using row operations and use the results to solve a system. I'm not likely to do both – this is time consuming either way.

There will be a word problem, which you are invited to solve using your calculator, but be sure to show the system of equations you set up and indicate how you used your calculator to solve it (show your setup).

Section 8.7 might or might not be covered. I could ask you to evaluate a determinant or solve a system using Cramer's rule.

Chapter 9: In section 9.6, I will ask for conversions between polar and cartesian coordinates for points, and I will have a question about conversion of a polar equation to cartesian form. It would be a good idea to know how to complete the square to find the center and radius of a circle from its equation.