MS 112 FINAL EXAM STUDY GUIDE MAY 2008

Sect/ Pg	Problems	Comments
		SEE GENERAL COMMENTS AT THE END OF THIS GUIDE BEFORE YOU BEGIN.
NOTE	on use of ^ to show powers	The only way I can do exponents in this guide is to use ^ to indicate a power like most of your calculators do.
2.6/94	9,19,23,27,29,31,55	**Linear Inequalities & Compound Inequalities.** Remember when solving linear inequalities, if you **multiply** (or divide) both sides by a **negative** number, the inequality symbol must be **reversed.** "AND" statements are intersections of the two solution sets, that is where they "overlap." "OR" statements are unions, which contains everything that is in either one of the sets or in both of them.
2.7/101	3,5,15,17,23	**Absolute Value Equations & Inequalities.** For solving absolute value equations equal to some positive number c, remember that exactly what is inside the absolute value must be set equal to each of c and to -c since the absolute value of each of these is c. So this creates TWO equations to be solved and TWO solutions. For solving absolute value inequalities either >c or <c, where c is a positive number, you may first find where the abolsute value actually equals c, then put these 2 values on a number line. This creates 3 sections on the number line, and you can "test" a number in each section to see if it satisfies the inequality or not. **NOTE:** Do NOT confuse this with the similar idea of testing values in a non-linear inequality that is >0 or <0, where you must merely test the result as to + or -.
BG 4.4/193	3,9,15,37,47,57; See also WS#1 & #2	**(This section was not technically covered; however, the techniques were used in some problems.) Sums of Rationals & Complex Rationals.** (Adding & Subtracting Algebraic Fractions) Remember to factor denominators in order to find the Least Common Denominator, and leave them in factored form. **CAUTION:** Do not confuse this with SOLVING rational equations (4.6) where you can multiply by the LCD and "remove the fractions" from the equation in order to have a simpler equation to solve. Here (4.5), you are adding (or subtracting) "fractions", so you **must keep exact equality** to the original expression and your **answer** will almost always **still** be a **"fraction." (NOTES #1 & #2)**
4.5A/200	7, 9	Division of a Polynomial by a Monomial. Remember that the resulting polynomial will have as many terms as the original polynomial.
4.5B/200	21,23,35,45	**Polynomial Long Division**. Not all division problems can be done by Synthetic Division, so it is important to understand this procedure. Please follow the method shown in class of putting the changed signs for subtraction in "circles." Remember you might want to put 0x^n for any missing powers of x in the divisor or dividend so that like terms stay lined up properly for subtraction. **(NOTES #3)**
4.5C/201	57,59,61	**Synthetic Division** (which can be done by Long Division) If you choose to use Synthetic Division on some types of problems, remember that the divisor MUST be of the form (x-c) and "c" is the "number" that is used for the divisor. Also remember to place "0's" for any "missing" degrees of x in the dividend. **(NOTES #4)**
4.6A/208	5,21,23,29,31	**Solving Rational Equations**: Multiply by the LCD, then evaluate what kind of equation you have to solve. If it is Quadratic, set = 0, Factor & Solve. (See NOTE to 6.5B!) If asked for "Restrictions", remember these are the values of x that would make the denominator 0. Remember to Mentally Check your answer against the original equation or these "Restrictions" to make sure it doesn't put a 0 in the denominator and make the equation undefined. **CAUTION:** Do not confuse these problems with adding or subtracting rational expressions (4.5) where you must keep exact equality to the original expression as you proceed. In these problems (4.6), you are SOLVING, so your final answer should be of the form x = a number. **(NOTES #5 & #6)**
4.6B/208	45,49,55	**Ratio & Fraction WORD Problems.** Remember to Label your unknown and set up a proper equation and solve it.
BG: 5.1/231	7,25,35,53,57,71; See also WS#5	Integer Exponents. Although this is not technically IN the syllabus, you will find it helpful to go over these problems as a review of the exponent rules. It will help you on the more difficult fractional exponents in 6.6, and also in the exponential and Log work from the end of the semester.

Sect/ Pg	Problems	Comments
BG: 5.2/242	5,15,23,35,41,45,61, 69,73; See also WS#3, #4 & #6	Radicals. Again this is not technically IN the syllabus; but if you need to brush up on your basic radical skills, this is the place to do it. Includes rationalizing square & cube roots of numbers.
5.5/260 6.2B/293	1,11,27,29,31 21,23,25	**Solving Radical Equations**: Remember to **ISOLATE the Radical BEFORE Squaring** or Cubing as needed. FOIL when needed. **MUST SHOW CHECK for ANSWERS!** (When raising both sides of an equation to an even power.) **(NOTES #11)**
5.6A/266	7,11,19,21,23; See also WS#8	**Fractional Exponents.** When asked to "EVALUATE", your answer should always be a Number.... In this case, there should be no exponents left in your answer. Remember to think about the fractional exponent like a radical in which the denominator tells the Root & the numerator gives the Integer power. You will probably want to get your expression back to a form with correct positive exponents first. Then, whenever possible, take the Root first, then do the integer power, so that your numbers will stay as small as possible. **(NOTES #12)**
5.6B/266	33,37,41,45,47,51,53	**Notation:** Changing between Exponent & Radical Form with the above idea in mind. Be careful of order of operations to remember what is actually raised to the power and what is not! (Example: 2x^(1/2) = 2 "times" the square root of x NOT the square root of 2x)
5.6C/266	59,65,67,69,73,75	**Simplifying Fractional Exponents.** Remember to use your exponent rules here. Do NOT put into Radical form. Just apply the rules with the arithmetic in fractions instead of integers as it was in 5.1. Remember to properly evaluate constants (numbers) raised to exponents. **(NOTES #12)**
6.1/285	15,27,33,39,47,69,85, 89,93	**Complex Numbers:** (NOT the same as complex fractions!) Remember when working with Complex Numbers that you can not do the same things that you are used to doing with multiplicaion of interiors of radicals if they are NOT positive. Rule of thumb is: change square root of a negative into an "i expression" first, then proceed with the other operations involved. If you think about it, we are again just following a natural order of operations. Denominators must be Rationalized just like Radicals in denominators. (Think: i is just "square root of -1"). The procedures are really just the same: i(i) = i^2 (i squared) which is -1, so we can "remove" i from the denominator in a monomial term by multiplying by i/i (=1). If i is in a binomial term, then we use the idea of a "conjugate" like section 6.4 (a + bi) is multiplied by(a - bi) to give a^2 -(b^2)(i^2) = a^2 + b^2 since i^2 = -1. Of course, the numerator is multiplied by the same thing so as to always multiply by 1 and maintain equality. **(NOTES #13)**
6.2A/293	3,9,13	Determining best way to Solve equations. These can be Set = 0, Factored & Solved
6.2C/293	37,39,43,57,63,67	**EXTRACTING ROOTS:** These can be written in the form of something squared = a constant. Remember the idea of "Isolating the thing squared" before taking square root of both sides. Then take square root of both sides. REMEMBER + or -! (NOTE on Chapter 10: Remember that a similar idea is used in some of the problems in Chapter 10 where we need to solve for an unknown that is inside parentheses raised to some power n. Using the idea of extracting roots, we can solve these by taking the nth root of both sides if we have isolated that ( )^n as we isolated the thing squared here. In these applied problems involving money, etc., we will only be concerned with the positive root even in the case of an even power.) **(NOTES #14)**
6.3A/299	3,9,17,21,37	**SOLVING BY COMPLETING THE SQUARE:** Remember to *first get the coefficient of "x squared" term to be 1* , then proceed. There will be at least ONE PROBLEM WHERE YOU WILL BE REQUIRED TO SOLVE BY COMPLETING THE SQUARE! **(NOTES #15)**
6.3B/299	39,45,47,49	**How to solve any Quadratic**: See if it will fit the pattern for Extracting Roots. If not, then Set = 0 & try to Factor. If not able to factor, then proceed to solve by Completing the Square or by the Quadratic Formula. (Which is covered in the next section.)
6.4/307	11,15,25,27	**SOLVING EQUATIONS by the QUADRATIC FORMULA:** Remember to Set = 0 BEFORE using the formula. There will be ONE PROBLEM WHERE YOU WILL BE REQUIRED TO use the Quadratic Formula! Remember to show your "Substitution Step", and make sure you know how to SIMPLIFY your answer. **(NOTES #16)**

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6.5A&B/317	5,11,21,23,25	**More Quadratics & Rational Equations for Practice.** NOTE to 6.5B: The Rational equations here are worked the same way as problems in 4.6A EXCEPT that some that come out as quadratic equations MAY NOT FACTOR, so you will have to use the quadratic formula or completing the square to finish solving.
6.5C/317	33,37	**"Quadratic Forms":** First Set = 0 & Factor as a trinomial, then use Extracting Roots- see Example 4 on page 311. NOTE: Do not confuse these with general polynomial equations like those in 9.3. (Although they can be worked as we did in 9.3, the techniques shown here are much simpler for these problems, and I will not be giving you a factor as I did in 9.3) Notice all of these in 6.5C have 3 terms and are 4th degree, so that they can be FOIL factored using "x^2" instead of "x". Your other clue that it is not a "9.3" equation is that I will not give you a factor as I do with those.
6.5D/317	43, 49	**Number or Geometry Word Problems.**
6.5E/318 WS#9	55,57; 1,7,11	**D=RT Word Problems.** If you use the "Box", that can label your unknown **IF** you write the appropriate parts of the D=RT equation above each box. You still MUST set up and solve an appropriate equation.
WS#10	1,3,5,9	**Inequality Notation:** As on Test #2, problem 10, be able to write the Interval Notation and Inequality forms to match a Number Line Solution. **(NOTES #17)**
6.6/325	1,11,19	**Nonlinear Inequalities.** Have your expression set either > 0 OR < 0, and in FACTORED form, then find where every factor is 0. Put these "Critical Numbers" on the Number Line & test a number in each "section" created by these Critical Numbers. The number is put back into the factored expression to determine if it makes the expression positive (> 0) or negative (< 0). Match up the sections that give the correct positive or negative match to the problem. These sections on the number line represent your answer. You should be able to interpret that back into Interval Notation and Inequality Form as was practiced in WS#10.
8.1A/399	3,15,23	**Evaluating functions & function Notation** will be covered. (NO Questions on Domain or Range.) **(NOTES #8)**
8.2A/408	1,7,13,15	**GRAPH LINE:** Plot x & y-intercepts & use slope or x,y chart to find 3rd point. Must be able to identify the slope and find your x-intercept algebraically. **(NOTES #9)**
8.2B/411	17,19,21,22; See also: WS#7	May use either method to **write the EQUATION OF A LINE,** but final answer should be in: f(x)=mx + b form or y=mx+b form. (See Section 7.5 & WS#7 for extra help) Remember with either method, you will need a point and the slope of the desired line in order to write its equation. Method shown in class uses a point **(a,c)** ....(it's hard to do subscripts here)... and slope **m** to get a "Working form of the equation" . "Point-Slope Form" y **-** **c** = **m** (x **-** **a**). Substitute in the values that you find by your work in the problem, and simplify to the form y = mx + b. Then, substitute f(x) for y and you have f(x) = mx + b as the book did, or you may leave in y = mx + b form. **(NOTES #10)**
8.3/419 8.4A&B/430	9,11,13,19; Use with: WS#11 1,3,7,25,27; Use with: WS#12	**PARABOLA:** There will be ONE PARABOLA TO GRAPH. The equation will be given in both "Vertex" Form and in Polynomial Form for the Graph ONLY. There may be **other questions** related to parabolas like problems #24 & 26 on Test #1.. For example: Be able to get equation into "Vertex Form" & be able to answer questions such as find the vertex, & the x & y intercepts & the "zero's" of the function. Remember to look for x-intercepts and "zero's" of the function in the same way by setting y=0 (or equivalently f(x)=0) and solving for x. If this value is a real number, then it will represent **both** the x-intercept and the "zero"; however if it is a complex number (has an i in it), then it is a "zero" of the function but it indicates that there are NO x-intercepts. **(NOTES #18)**
8.6/448	1,11,13,15,27	**Combining Functions.** DO NOT CONFUSE "multiplication" with "composition" of functions. No questions on Domain or Range. **(NOTES #8, page 2)**
9.1/468	9,11,15,31	**More Synthetic Division**
9.2A/472	3,11	**Remainder Theorem:** Remember that for a f(x)=polynomial, the value of f(a) can be determined in 2 ways: 1. By direct substitution; 2. Using the remainder theorem which states that the value of f(a) is the same as the remainder that is left when f(x) is divided by (x-a). This can be done using **Synthetic Division,** and is often is easier to calculate.

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9.2B/473	25,29,35,37,41	Use Synthetic Division or Long Division and the **Factor & Remainder Theorem** to test whether something of the form (x-c) is a factor of a polynomial, f(x). If the Remainder is NOT 0, then (x-c) is NOT a factor of f(x). To SHOW (x-c) **is** a factor of f(x), show Remainder=0 when dividing f(x) by (x-c). Then the "b" part will be: Complete the Factorization of f(x). CAUTION: There is NO equation to solve ... just give f(x) in completely factored form!
9.3/477-478 WS#13	Examples 1 & 2 3,5	Here you give me **all the <u>possible</u> rational solutions**. This is all possible combinations of c/d where c is a factor of the constant term and d is the coefficient of the highest degree term in these examples. DO NOT SOLVE!
9.3/483 & WS#14	2, 13, 19	**SOLVE the poynomial equation.** Remember when you are asked to SOLVE, you will come down to x = "a number" (or several alternatives). As in WS#14, you will be **given** a factor of the polynomial. Using either Synthetic or Long Division by this factor will give you a Remainder of 0 verifying that this is a factor of the polynomial and at the same time giving you the quotient as the corresponding factor of the polynomial. Setting the product of the given factor "times" the quotient in place of the polynomial (which is already set =0) should have you at a level where these factors are not more than a quadratic, so that you can complete factorization and SOLVE. In general you might have to use the quadratic formula here on the remaining quadratic, but I will be "nice" on the **final** and it **should factor!** Now once you have your polynomial in Factored Form = 0, it SHOULD BE SIMPLE to pick out the solutions by setting each factor = 0.
9.4/494	11,13,21	**Polynomial Graphs.** For the graph, you will be given the function in factored form. Find x-intercepts & y-intercept. Then use the Number Line approach, picking out test x-values in each section created by the x-intercepts to determine if that "section" is **above** the x-axis (has + y-values) or is **below** the x-axis (has - y-values). Then make the graph go thru the x-intercepts and up or down to fit the Above and Below information from your Number Line. This will be a continuous graph with no breaks in it.
9.4/494	23, 25	**Intercepts for Polynomial Graphs: (For this problem, you will NOT Graph.)** You may be asked to just find the x- and y-intercepts for a polynomial function. If this is not already factored, you should be able to factor it to determine the x-intercepts by setting f(x)=0; and of course, set x=0 to find the y-intercept.
9.5/506	GRAPH: 3,7,17	**Rational "Graphs":** Remember to find your Vertical & Horizontal Asymptotes as one of the first steps. (See next question type for reminder on finding VA, HA, and intercepts for Rational Graphs.) The V.A. and the x-intercept(s) will be the critical numbers for your Number Line around which you will pick the test x-values to determine where the graph is **above** and **below** the x-axis as you did with the polynomial graph. Put the asymptotes and the intercepts on the graph first; then use the information as to where the graph is above and below the x-axis. Make sure that you show correct shape "going to the asymptotes" and that you have not "created" an x-intercept that does not exist.
9.5/510	Type II Question 3,7,9,17,19	**Rational "Graphs":** For this question, you will NOT GRAPH; however, I will ask you to find Vertical & Horizontal Asymptotes & any x- & y-intercepts. Remember: To find Vertical Asymptotes, set the denominator = 0 and solve for x. To find the x-intercepts, set the whole function (y) = 0, which is equivalent to setting the numerator = 0, and solve for x. For the y-intercept, set x=0 and solve for y. For Horizontal Asymptotes, if the numerator is a constant, then the H.A. is y=0; otherwise, look at the ratio of the largest degree term of the numerator to the largest degree term of the denominator. For problems on the final, these will be of the same degree, so the ratio will reduce to a constant rational or integer.
10.1A/ 528	3,7,15,17,25	**Solving Exponential Equations.** Remember to get each side of the equation as the SAME BASE raised to a power, then set the exponents equal. NOTE that these are solved with NO calculators and NOT with use of LOG. They do look similar to the calculator problems & could be worked that way, BUT the point here is do you understand the connection of the exponent rules and the bases, and how to use them. Answers are NOT acceptable in unsimplified "Log" form. **(NOTES #19)**

Sect/ Pg	Problems	Comments
10.2/538	25	I will give you any of the formulas needed for Interest. Remember, you will NOT have a calculator, so you will leave your answers in "exact, unsimplified form" (ready to go in the calculator) as has been shown repeatedly in class.
10.3/550	19, 23	**Inverse Functions:** Be able to verify that 2 given functions are inverses of one another by showing that the compositions "both ways" result in x. I must see the steps involved!
10.4A/ 560	3,7,13,17	Using the Definition of LOG (to a certain base) to write Logarithmic Statements as Exponentials & vice versa.
10.4B/ 560	23,27,35,37; See also: WS#17	**Evaluating Logarithms** Either evaluate directly using Property #5 on page 2 of Notes #20 or the ideas on page 1 of these Notes under "Evaluating Logs Without a Calculator." Remember to look for those that the base and the "A" value can both be put into the same base for this method. (Keep thinking: A Logarithm IS AN EXPONENT!) **(NOTES #20)**
10.4C/ 561	41,47,49	**Solving Simple Log Equations:** Use the Definition of Log to that Base to rewrite the equation as an exponential equation & solve. **(NOTES #20)**
10.4D/ 561	69,71,73,75	**"Breaking Up"** a single **Log** expression as the sum &/or difference of simple Logs. You will be using Proerties 6, 7, & 8 from **NOTES #20.**
10.4D/ 561	81,85,87	**"Collapsing LOG** Expressions" to a SINGLE LOG. You will be using Proerties 6, 7, & 8 from **NOTES #20.** (Of course, you will be using them "the opposite way.")
10.4E/ 565	89,91,95,97,99,101	**Solving Log Equations**: Get all "Logs" to one side, constant on other, "Collapse" to single Log expression, then use Definition of Log to that Base to rewrite as exponential equation. (See **Notes #20**) Solve algebraically. **Remember to check mentally** that answers don't make original equation undefined by getting the log "of 0 or of a negative number."
10.5		**No questions directly from 10.5 since this is a basic plug into calculator problem.**
10.6A/ 578	1,5,15	**Solving Exponential Equations Requiring Log:** The key to knowing that these are not solved like the ones in 10.1 is that here you can not get both sides of the equation written in terms of a common base. NO CALCULATORS ON FINAL! So solve exactly: For example, answer left in #1 as Log[13]/Log[3]. Remember to ISOLATE THE EXPONENTIAL before taking the Log or Ln of both sides of the equation. Remember, do NOT get these confused with those in 10.1 that can be solved exactly to a "Nice" number not involving log.
10.6B/ 578	21,23,25,27,29	**Solving More Log Equations:** As 10.4E above if possible. If no constant present, get in form: Log[A]=Log[D] & set [A]=[D], then solve algebraically. **CAUTION:** This is **NOT** "division by Log". If your work indicates such an idea, points will be lost even if the answer is correct! Remember to check mentally as in 10.4E.
10.6C/ 578	33, 37	**CHANGE OF BASE:** NO CALCULATORS ON FINAL! So evaluate exactly: For example, answer left in #35 as Log[16]/Log[3].
10.6D/ 578	43,45,49	**Applications of solving Exponential Equations using Logs**. Remember the Note about Isolating for 10.6A and leaving answer EXACT since you will not have a calculator.
13.1/693	1,3,5,21,28	**Equations of Circles:** For all of these leave equation in Standard ("Center-Radius Form") (x-h)^2 + (y-k)^2=R^2. (Do square R, i.e., don't leave as 9^2, but write 81.) For ones like 21 & 28, you will be required to put the equation into "Center- Radius" Form by Completing the Square and then identify the Center and Radius.

There will not necessarily be one entire problem from each "section" as there may be parts & some may be combined in this way. Use this Study Guide & your old tests & Worksheets as a basis for your study. If you have difficulty with a certain problem you might find it helpful to go to the corresponding topic under Notes on my WebPage.. Just be aware that some of the Section Numbers have changed since I originally did these notes because of the edition changes in the book; but I have indicated which Notes go with which sections here on the Study Guide. Also, I do not have NOTES on all of the sections. Be ready to ask questions on Tuesday!