Math 120 Syllabus, Spring 2003

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Final Exam: Tuesday, May 6, 8:15 – 10:15 PM.
Math 120 College Algebra
5 credit hours, Spring 2003

Instructor:
Office:
Campus Phone:
E-mail:

Office Hours:
Give students at least three office hours each week to visit you. You can announce this
later in class once you are sure of your schedule.)

Addison-Wesley.

Classroom and Meeting Times:
(Insert your classroom and meeting times)

Catalog Description:

Math 120.  College Algebra (5), I, II, III.  Polynomials, factoring, rational exponents, linear and quadratic
equations and inequalities, applications; polynomial, exponential and logarithmic functions and their
graphs; systems of equations, theory of equations. Not to be taken if credit for MATH 128 or MATH 130 has
been received.  Prerequisite: two years of high school algebra, one year of geometry, and a satisfactory
placement exam score.

Course Policies

Attendance.  You are expected to attend class each day because the material covered in
class will be the basis of all quizzes and tests.  Attendance will be taken each day.  There will
be no make-up quizzes or exams except for University sponsored events in which a
written University excuse is provided and arrangements are made prior to the  absence
with the instructor.  No make-up work will be given for situations such as illness, family
emergencies, and early departure for vacation, etc.

Homework and Quizzes

The pace of the course is faster than in the high school setting since you have seen most of
the material before.  However, there are sections of the course with ideas that will be new
to you.  Also, the level of mastery of College Algebra at the University is quite high so that
we can guarantee you will be successful in future mathematics courses such as calculus or
statistics.  For these reasons homework will be given each day and will form the basis of all
tests and quizzes.  You will be asked to turn in homework on a regular basis and it will be
graded.  The instructor will also give approximately 7 quizzes.  A total of 100 points will be
calculated based on the homework assignments (50 pts.) and the best 5 quizzes (50 pts.).

Comprehensive Final Exam is Tuesday, May 6 at 8:15 PM.
**Course Grades and Grading Policy**

There will be three exams given during the semester and a comprehensive final exam will be given during finals week on the scheduled date of Tuesday, May 6 at 8:15 p.m. Each of these exams will have a point value of 100 points for a possible total of 400 points. The homework grade will be based on 100 points.

- **Test #1** (Feb 11, 7:30 -9:00 p.m.) 100 pts.
- **Test #2** (March 25, 7:30-9:00 p.m.) 100 pts.
- **Test #3** (April 22, 7:30-9:00 p.m.) 100 pts.
- **Homework & Quizzes** 100 pts.
- **Final Exam** (May 6, 8:15-10:15 p.m.) 100 pts.

**Total** 500 pts.

There will be **no make-up exams given for Test #1, 2 or 3**. All three of these exams will be counted toward your course grade so you must plan to take all three exams. In the special case that an exam is missed you must see your instructor immediately. Generally, no make-up exams are given EXCEPT FOR MEDICAL EMERGENCIES.

On a total of 500 points you can expect a course grade based on the following:

- **A** At least 450 pts. (90%).
- **B** At least 400 pts. (80%).
- **C** At least 350 pts. (70%).
- **D** At least 300 pts. (60%)

**Advice on how to be successful in Math 120**

Experience shows that the most essential ingredient in being successful in Math 120 is attending every class and doing all the homework. The instructor will take exam and quiz material from the homework assignments and examples in the text. You should always read the book, especially the examples highlighted in blue, before doing the homework and as a guide in preparing for exams. Keep good records of your homework and your class notes and study class notes on homework solutions by your instructor. Learn to write up solutions like your teacher does as this will help your organizational skills and give you efficient methods of solution. Make up your own possible test questions so you will not be surprised at the questions on the instructor’s test. If you do that, you will probably guess 80% of the exam questions ahead of time.

Go to your instructor for help with homework and advice about the course. It is also recommended that you go to the University Math Lab with is located in University Hall. The University has set up free tutoring there for Math 120 and you can work there with other students on your homework. Many math majors work at the Math Lab as tutors and will be very helpful. If you feel that the course is moving too fast for you or if you are not doing well on exams, go immediately to your instructor for advice. You may need to go to the Math Lab everyday but at least you will get through the course and that will be a great accomplishment. Good luck!

**Calculators.** The TI-83 is strongly recommended for this course and all class discussion will be based on the TI-83 model. You may use other graphing calculators but your will be expected to translate any necessary commands for your particular model or type.

Comprehensive Final Exam is Tuesday, May 6 at 8:15 PM.
Math 120
Homework Assignments & Instructor Comments

Intro to Graphs and Graphers

Page 11-12: # 1,2,5,7,9,13,16,17,23,31,32,34,35,37,38,45,49,48,54,55,59,62
Make sure to graph the equation of a straight line and a parabola by plotting points by
hand. Show students how to use the table feature of the TI-83 to obtain points for plotting.
Pick an example such as y = 2x – 50 to illustrate that the standard window will miss a lot of
the graph and to try to find a window that will show where the graph crosses the axes.
You will have to practice with the STAT menu to use the STAT PLOT feature. (See
graphing calculator manual that comes with the text.) Emphasize how to find the
intersection point of two lines. Also emphasize how to find the intersection points of a
parabola and a line when the intersection points are not in the standard window. Learn to
use the projection equipment for the TI-83 for classroom demonstrations. It is very easy
and is obtained from our secretary Mary.

Chapter R

R.1 (Page: 19 -20)
#2,3,5,6,7,8,10,11,12,14,15,18,21,23,24,27,28,30,33,35,36,43,45,48,51,52,57,58,60,62,63,66,67

Emphasize the difference between integers and rational numbers. Explain why a real
number with terminating or repeating decimal is rational by giving examples such as 2.436
and 1.22222 (repeated 2). Spend some time reviewing how to add, subtract and multiple
fractions as this will help with the algebra later. You might consider explaining why √2 is
irrational. Draw a picture of the real number line and indicate that there are infinitely
many irrationals and rationals. Emphasize the distributive law and the multiplicative
inverse property of the reals. Illustrate the properties of absolute value by giving
numerical examples.


This section is difficult for the students. To see for yourself just give a problem like # 17 in
the homework or a quiz and over half of the students will miss it. So spend some extra
time here on simplifying expressions with exponents (# 1-28). Students do not understand
scientific notation well so don’t assume any previous understanding.

R.3 (Page 31-32) # 1, 3,6,9,10,13,14,17, 18, 20, 21,25, 28,31,35 38, 39, 42

The most common mistake that students make is to forget to distribute a minus sign
through an expression. They also miss the middle term of an expression (ax + by)².
Emphasize problems 9, 10,28, 31.

R4 (Page 36-37)
#3,4,7,8,9,11,12,13,15,16,19,20,23,24,25,2,27,29,30,33,34,35,39,40,41,43,45,48,51,59,63,65,75,77,
79,85.

I have found that this is the most difficult of the sections in chapter R for the students.
Derive the formulas in the text for the difference of squares and the sum and difference of

Comprehensive Final Exam is Tuesday, May 6 at 8:15 PM.
cubes. Go over problems carefully and give several quizzes. Students can’t seem to follow
the difference of two cubes formula and don’t recognize how to factor a problem like #19
by making y⁻⁴ = (y²)².

R5 (Page 43-45) # 3,4,8,9,11,14,15,18,19, 21,25,27,28,31,32,33,36,37,39,41,47,50,52,55,61

Expect students to have great difficulty with this. Problems 47-62 are especially hard for
them.

R6(Page 51-53) #
1,4,5,7,13,16,17,21,24,26,27,32,33,35,39,41,47,49,51,52,53,59,63,69,75,79,83,87,93,94,101,104

This section is difficult to teach because the final answer in many problems has many
equivalent forms. Do the problems about the Pythagorean theorem.

R7(Page 57-58)#3, 6, 9,12, 13,16, 19, 21, 23,24,29.

Emphasize the ideal that squaring an equation introduces extra solutions in general. For
example x = 2 has only one solution however x² = 4 has two. I have found that students
have some problems with problems 71-80 so work a couple.

REVIEW: IF TIME PERMITS ASSIGN SOME EXERCISES FROM THE CHAPTER REVIEW.

Chapter 1

1.1 (Page 75-77)# 1, 3,4,5,9,10,15,17,20, 22,23,27,31,33, 38,39,41,45, 47,49,50, 53, 57,59,60

Emphasize the domain and range of functions such as (3-x)¹/² and (9-x²)¹/² by looking at the
graph and a table of values using the TI-83. Exercises 57-60 clearly illustrate the idea of
domain and range and are worth talking about in some detail.

1.2 (Page 92-93) # 3,4,5,6,7,8,11, 12, 13,15,17, 21,27,28,29,
31,37,43,45,46,47,48,49,51,55,57,58,68,69

Emphasize how to find the equation y = mx + b for a line joining two points in the plane.
Emphasize the idea of parallel lines and perpendicular lines and the theory about the slopes
of such lines. Go over problems 51-58 in great detail. Work on a couple of word problems
using linear equations so the practical nature of such functions is understood.

1.3 You can skip this section but if you have time show how to find the equation of the
regression line by using the TI-83. See Graphing Calculator Manual for simple
directions.

1.4 (Page 116-119). #1,3,4,5,7,9,11, 19, 21, 22, 23, 30,31,
34,35,39,41,49,51,52,54,56,58,60,61,62,67,71,72,77,78,79.

This is a difficult section with a lot of ideas. It takes time to cover. Work out the word
problems (21-34) which are assigned, as they are the hardest for the students. Try to help
students understand the difference quotient ideas in Example 10 in text. Emphasize how to
graph piecewise defined functions. The domain of f/g is especially important.

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1.5 (Page 135-137)#1,3,4,6,9,12,15,17, 33,35,38,43,45,53,57,59,60,61,65,67,76,77,79,87,88,89

Students should learn the rules on page 123 about algebraically testing for symmetry. The concept of even and odd function is less important and I usually state that an even function behaves like \(y = x^2\) and is symmetric to the y-axis. The function \(y = x^3\) is an odd function and is symmetric about the origin. Emphasize vertical and horizontal transformations and reflections but DO NOT cover vertical and horizontal stretching and shrinking as this is just too much information at this point of the course. Questions on tests and quizzes about transformations should be similar to the assigned exercises 59-89. This is a fairly long section to cover.

1.6 Page 144-146) # 1,3,10,13,18,20,31,34.

This is a short section. Emphasize the combined variation concepts on page 142.

1.7(Page 151-153)# 1,5,7,8,9,11,21,25,26,28,29,31,32,33,35,38,39,53,57,58

Be sure to prove the distance formula. You can also prove the midpoint formula as is done in exercise #59 on page 153. Emphasize how to find the equation of circles and how to graph them by hand and also on the TI-83. Students will have trouble solving \((x-h)^2+(y-k)^2 = r^2\) for \(y\). You can also use this time to emphasize domain and range of the semi-circle \(y = \pm(\sqrt{r^2 - x^2})\). Students have trouble with a two-step problem like #29 so emphasize that.

IF TIME PERMITS YOU CAN ASSIGN SOME REVIEW PROBLEMS FROM CHAPTER 1.

CHAPTER 2

2.1(Page 169-171)#1,2,5,8,11,14,21,23,27,34,41,42,43,45,46,47,48,52,55,57

Work on the word problems and make equations when possible to illustrate the idea of solving a linear equation. Emphasize, using the TI-83, that the zero of \(f(x) = mx+b, m\neq0\) is the \(x\) –coordinate of the intersection of \(f(x)\) and the \(x\)-axis.

2.2(Page 177-178)# 3,4,5,7,9,13,15,17,18,21,25,28,31,33,37,38,41

Show students that \(a+bi\) is graphed at the point \((a,b)\) in the plane so that the set of Complex numbers is identified with the points in the plane. Show how to multiply complex numbers using the distributive rule as in example 5. Motivate the need for complex numbers in solving equations like \(x^2 + 5 = 0\).

2.3(Page 190 -191)#
1,3,5,8,9,11,14,15,18,20,21,23,25,26,31,32,40,48,49,55,61,63,65,66,67,68,71,72.

Work on simplifying the complex roots into the standard form \(a + bi\) in examples like #18,21. Students should know how to complete the square and also how to use the quadratic formula. Both will be asked on exams. Explain how easy it is to solve \(x^2 – a = 0\) without using the quadratic formula. Emphasize that if a quadratic has real roots then these are obtained from the x-intercepts of the graph. Use the TI-83 to find the zeros of examples like #31. Work on applications such as #62,63,65,66.

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2.4(Page 199-201)#1,2,5,9,12,15,18,20,23,25,28,29,33,34,37,43.

Emphasize how to use \( x = -\frac{b}{2a} \) to find the vertex of a parabola and how to graph parabolas using the vertex and the intercepts. Emphasize problems 20,23,25 and the word problems. Students should realize that the word problems all have a quadratic function to maximize or minimize and the answer is usually at the vertex.

2.5( We will skip this section.)

2.6(Page 213-214)#1,3,6,8,12,13,21,24,26,32,36,42,47,53,55,56,57.

Emphasize that some of the problems have solutions that do not satisfy the original equation and thus one has to always check solutions. Students will make a lot of mistakes in problems like #26. Students often can’t do problems like #53-57. Work on these.

2.7(Page 218)#2,3,7,9,13,20,25,31,32,35,38,39,41,51,56

Emphasize writing answers using inequalities and also using interval notation. Pay particular attention to problems like \(|x - 7| > 2\). You can consider teaching students to translate this last problem to words “The distance of \( x \) to 7 is greater than 2 units” and then draw a picture to obtain the answer.

IF TIME PERMITS YOU CAN ASSIGN SOME PROBLEMS FROM THE REVIEW OF CHAPTER 2.

Chapter 3

3.1 (Page 233-236) #1,2,3,4,7,8,9,13,15,17,21,24,32,33,37,40

Emphasize finding the zeros of functions and relative maximum and minimum’s by using the TI-83. Use the zero and maximum, minimum features by pressing 2nd Calc. If time permits you can do an example like example #4 in the text as an illustration.

3.2 (Page 245-246)#2,4,5,7,9,10,11,15,19,25,27,29,31,34

Teach both long division and synthetic division methods for dividing by \( x - c \). Emphasize guessing a root \( c \) for problems 29,31,34, using synthetic division, factoring (factor theorem), and then finding zeros.

3.3 (Page 253-254) #3,4,9,11,13,18,21,24,25,26,27,33,36,37,40.

Emphasize how to find all the zeros of a polynomial of degree three using the rational zeros theorem (#33,36,37,40). Make sure to use the fundamental theorem of algebra to explain that a cubic has three zeros, etc. Use the table feature of the TI-83 to check quickly the values \( f(p/q) = 0 \).

3.4 (Page 268-269)#1,2,3,7,12,13,17,19,21,23,24,27,40,41,50

Emphasize vertical and horizontal asymptotes and intercepts on the graphs of rational functions. Omit the study of oblique asymptotes as this is not essential. Students will have a great deal of trouble graphing using the TI-83 so you should them how. Try to explain

Comprehensive Final Exam is Tuesday, May 6 at 8:15 PM.
the rule on page 262 for horizontal asymptotes by dividing numerator and denominator by the highest power of x appearing in the function. (See example 4.)

3.5 (Page 275-277)# 1,3,7,9,12,18,21,33,36,37,41,42,43,50.

Emphasize solving quadratic inequalities (#7-18) first. Then use of the method of Example 3 to work on inequalities involving rational functions.

IF TIME PERMITS ASSIGN SOME PROBLEMS FROM THE CHAPTER 3 REVIEW.

Chapter 4

4.1 (Page 294-295)
#1,7,9,13,14,18,21,26,27,30,31,32,39,41,42,45,46,49,51,57,59,63,67,69,71,73,79,82,85,88,94.

This is a difficult section to teach. Emphasize the horizontal line test and that a function has an inverse if it passes the horizontal line test. Emphasize the fact that the domain of \( f^{-1} \) is the range of \( f \) and the range of \( f^{-1} \) is the domain of \( f \). The goal of the section is for students to be able to see that an exponential function such as \( y = 10^x \) has an inverse which is obtained by reversing the ordered pairs in the graph of the exponential. Hence, emphasize how the graphs of \( f \) and \( f^{-1} \) are formed.

4.2 (Page 307-309)# 1,3,4,5,11,19,20,21,22,36,37,38.

Graph \( y = a^x \) for \( a = 2, e, 10 \) as examples of growth curves. If \( a < 1 \), the exponential curve is a decay curve. Work the homework problems similar to example 5 in the text. Require the students to know the formula for compound interest and view the formula as an exponential function. Motivate the definition of \( e \) using the calculator as done on page 305.

4.3 (Page 321-323)
#1,2,3,4,5,8,9,11,13,14,16,17,18,19,21,25,27,28,29,30,32,34,36,39,40,42,43,47,48,49,51,52,55,57,64,65,67,68,70.

Emphasize the definition of logarithm base \( a \) on page 313 and do examples like the homework. Keep emphasizing that \( a^x \) and \( \log_a(x) \) are inverses of each other and draw the graphs for \( a = 10 \) and \( a = e \) each day for a week. Prove the change of base formula and show then how to use it with their calculator to compute \( \log_4(78) \), for example.

4.4 (Page 331-332)#
1,2,6,7,10,12,13,15,17,20,21,24,25,26,27,29,31,32,33,35,37,40,41,47,48,49,53,55,56,58,60.

Prove the product, quotient and power rules using the definition of logarithms. Tell students to learn the table on page 331. Spend time doing problems like the homework.

4.5 (Page 339-340)# 1,5,9,13,17,19,25,27,28,29,31,33,34,36,38,40

Emphasize how to solve an exponential equation such as \( 3^{2x-4} = 5 \) by taking logs of both sides (base 10 or base \( e \) on TI-83). Practice with problems 25-40 which uses log properties to solve algebraically.

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4.6 (Page 350-355)#1,3,5,6,7,8,9,10,14.

Emphasize the population growth and continuous interest problems and do a couple of the carbon dating problems.