

Math 161X Course Content and Final Exam Content

Prepared by Jim Massa, Fall 2003

Text used is: *Introduction to Mathematical Analysis*, 10th ed. By Haeussler & Paul

Section(s):	Topic with description	Time spent
0.1-0.3	<ul style="list-style-type: none">Real Numbers and Properties of real numbers. Commutative, Associative, Distributive properties are covered.	1 hour
0.4-0.8	<ul style="list-style-type: none">Operations involving algebraic expressions, fractions are covered. Exponential rules are covered in depth as are operations involving radicals, e.g., rationalizing denominator, converting from radical form to the equivalent fractional exponential form. Methods of factoring are also covered as are special cases of factoring.	3 hours
1.1-1.4	<ul style="list-style-type: none">Linear and quadratic equations. Procedures to solve these types of equations are thoroughly examined. Emphasis is also placed on checking results to verify validity as solutions.	3 hours
2.1-2.2	<ul style="list-style-type: none">Applications of equations. Here, we apply the techniques learned in the prior section to answer word problems. Emphasis is placed on developing equations, understanding the logic that goes into developing equations designed to answer a question. Once an equation is developed, students apply the techniques to solve the equation. Emphasis is placed on business orientated problems. Linear inequalities. The concept of linear inequalities is introduced. Methods to solve linear inequalities are covered and proper ways to express solutions, e.g., interval notation, are stressed.	3 hours
2.3-2.4	<ul style="list-style-type: none">Applications of Inequalities. We apply what is learned from the previous section and apply them to specific situations involving word problems. Again, developing equations, understanding the logic involved is stressed with concentrations on business related problems. Absolute values. The definition of absolute values is introduced, techniques to solve these equations are covered which also includes absolute value inequalities.	2 hours
3.1-3.2	<ul style="list-style-type: none">Functions. The student is introduced to functions, the concept of functions, how to combine functions, e.g. $(f+g)(x)$, is covered in detail. Compound functions, composite functions, inverse functions are also covered in detail. Domain and Range for all these situations are examined. Difference quotient is also examined.	3 hours
3.3-3.6	<ul style="list-style-type: none">Graphs. An exploration of the basic graph types are introduced. Also examined is symmetry about the y-axis, the x-axis or the origin. Working with the basic graph types, we explore how translations (horizontal and vertical) and reflections affect how the graph will appear, as well as understanding how to express the various graph types in standard form, e.g., $a(x-h)^2 + k = f(x)$.	1.5 hours
4.1-4.2	<ul style="list-style-type: none">Lines and Linear functions. How to develop straight line equations is covered using slope, point-slope, slope-intercept methods. The nature of straight line functions is explored. Then this knowledge is applied to business applications where functions are developed.	2 hours
4.3-4.6	<ul style="list-style-type: none">Quadratic functions. The nature of quadratic functions is thoroughly covered. How to find intercepts (x and y), the vertex is covered; domain and range are also discussed, which way the resulting parabola opens. Business applications are discussed where these concepts are utilized. Systems of Equations. How to solve simultaneously 2 variable, 2 equation and 3 variable, 3 equation linear equation systems as well as non-linear equation systems are covered in depth. Business applications are covered emphasizing concepts such as market equilibrium and break even points as well as exploring tax effects on market equilibrium conditions and determining maximum profit or minimal cost.	4 hours

Section(s):	Topic with description	Time spent
5.1	<ul style="list-style-type: none"> Exponential functions. The nature of exponential functions (growth and decay) is covered including domain and range, translations, reflections. 	2 hours
5.2-5.3	<ul style="list-style-type: none"> Logarithmic functions. The nature of logarithmic functions is covered including domain and range, translations, reflections. Properties of logarithms. All the properties of logarithms are fully explored in great detail. 	2 hours
5.4	<ul style="list-style-type: none"> Exponential/Logarithmic Equations. Techniques and methods to solving these equations are covered. Also demonstrated via the concept of inverse functions is how exponential and logarithmic functions of the same base are related. Numerous applications are presented including population growth, compound interest. Base e and the natural log are also covered in detail. 	2 hours
8.1	<ul style="list-style-type: none"> Compound Interest. Using exponential functions, an examination of how money earns interest is covered, how increased pay periods translate into more interest earned. How to calculate final amounts or initial investment amounts are also covered. 	1.5 hours
8.2-8.3	<ul style="list-style-type: none"> Annuities. Present value and future value are covered. How to calculate periodic payments, determine interest earned, combining different annuities, paying off annuities are covered. Also covered is sinking fund. 	2 hours
8.4	<ul style="list-style-type: none"> Loans and loan amortization. Topics covered include periodic payments, how much is applied to principal and/or interest, total interest paid, the amount that is applied to interest and/or principal for a specific payment. With loan amortization, amortization tables are developed which then shows how principal gets reduced. Different scenarios are explored demonstrating how higher payments and/or lower interest rates affect the amortization table and how the total interest paid is affected. 	4 hours
7.1-7.3	<ul style="list-style-type: none"> Linear programming. Using two variable linear inequality along with constraining functions, optimal solutions to problems are developed. An important aspect in solving these problems is the graphical approach (involving the inequalities) where a feasible region (bounded or unbounded) is developed. From the graph, potential points are analyzed as being the optimal solution. 	3 hours
6.1-6.3	<ul style="list-style-type: none"> Matrices. An introduction to matrices and properties is covered. Adding, subtraction, multiplication (2 matrices or by a scalar) are covered. 	1.5 hours
6.7-6.8	<ul style="list-style-type: none"> Cramer's Rule. Calculating the determinant and applying Cramer's Rule to solving simultaneous equation systems involving 3 or more variables is covered. 	1.5 hours

Topics typically covered on the final:

- 1) understanding the nature of functions including domain and range
- 2) simplifying exponential expressions
- 3) solving equations (linear, literal, quadratic, rational, exponential, logarithmic, inequalities, absolute values, radicals)
- 4) graphing basic functions including key points, shifts, translations and reflections (linear, literal, quadratic, rational, exponential, logarithmic, inequalities, absolute values, radicals)
- 5) solving systems of equations
- 6) understanding the properties of exponential and logarithmic functions as well as applications.
- 7) apply objectives 1-6 to business applications and concepts
- 8) math of finance
- 9) finding the determinant of a matrix
- 10) Cramer's Rule
- 11) linear programming