math 111

FINAL EXAM LIST OF TOPICS

(About the final**)**

- **TIME:** 10:00 PM – 11:50 AM
- **PLACE**: MNB 103

- The department writes the final exam so I don't really know what's on it and I can't very well tell you what to study. You should be prepared for everything that we've covered this term
- The exam will focus on chapters 4 &5 (about 80% of the exam); so there still will be some things from chapters 1-3, but not a lot.
- Story problems and being able to make sense of an answer using words is an important part of the course, and somewhere between 45-60% of the exam will be word problems (at least, that's been true in past exams)
- You may use a double sided 3X5 notecard for the final – scratch paper will also be provided
- You will need your calculator, but you are expected to show **all** of your work, unless explicitly stated otherwise – make sure your batteries are working. **I will not be lending out my calculator on the exam day**.
- No scantron/bluebook needed

(Review Series**)**

- Know how to find domain and range of a function (via graph, equation, mapping diagram, table)
- Know how to find the difference quotient
- Know how to find average rate of change for a nonlinear function over an interval
- Be comfortable with graphing, evaluating, and finding the domains of piecewise functions
- Know how to find complex solutions to quadratic equations
- Understand how to find the vertex of a quadratic function either vertex of standard form
- Know how to find the maximum or minimum values of quadratic functions (by finding the vertex)
- Know how to set up quadratic functions that model specific situations
- **Know how to use the 10 transformations to manipulate graphs and their tables.**

(chapter 4**) –** More Nonlinear Functions and Equations

(4.1**) –** More Nonlinear Functions and their graphs (page 232)

- Know and understand the definition of a polynomial function
- Know how to find local and absolute extrema
- Be able to identify if functions are odd or even by
  - examining the graph of the equations and checking its symmetry; or
  - using the definitions of odd and even ($f(-x) = -f(x)$ and $f(x) = f(-x)$ respectively)

(4.2**) –** Polynomial Functions and Models (page 243)

- Know how to determine a polynomials function's end behavior (falls to left, rises to right, etc…)
  - know how an even/odd degree polynomial functions behaves
  - be familiar with limit notation ($f(x) \to \infty \ \ as \ \ x \to \pm\infty$ etc…)
- Know how to determine a functions minimum degree by looking at the graph (using turning points and x-intercepts – and later with multiplicities)
- Know how to determine whether a poly function's leading coefficient is positive or negative

(4.3**) –** Division of Polynomials (page 260)

- Know how to divide polynomials using
  - long division
  - synthetic division
- Understand how dividing polynomials is useful in determining the "zeros" of a poly function

(4.4**) –** Real Zeros of Polynomial Functions (page 267)

- Understand the factor theorem
- Know how to write a polynomial in complete factored form
- Know how to find the multiplicities of a function given it's graph and how to write multiplicities in the complete factored form
- Know how to use the rational zeros test to find the rational zeros of a polynomial function
- Know how to find the number of possible positive zeros and the number of possible negative zeros using Descartes' Rule of Signs

(4.5**) –** The Fundamental Theorem of Algebra (page 283)

- Know what the fundamental theorem of algebra says, and why it is so important
- Understand that ANY polynomial function can be written in complete factored form using complex numbers
- Be able to find the complete factored form of polynomials
  - This may require using the rational zeros test to find any real zeros, then dividing through using that zero to simplify the original polynomial into something you may be able to factor
  - Be able to write complete factored form given the leading coefficient and a few zeros
- Know the complex conjugate zeros theorem

(4.7**) –** Inequalities (page 306)

- Know how to find boundary points for both polynomial and rational inequalities
- Know how to use a sign analysis

(4.6**) –** Rational Functions and their Models (page 289)

- Know what a rational function is and how to find it's domain
- Know how to find vertical and horizontal asymptotes given
  - the functions graph
  - the equation of the function (don't forget to simplify if possible!)

(4.8**) –** Power Functions (page 322)

- Know how to use the properties of rational exponents to simplify radical expressions
- Know how to solve equations with rational or negative exponents
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(chapter 5**) –** Exponential and Logarithmic Functions

(5.1**) –** Combining Functions (page 349)

- Know how to perform the four basic operations on functions ($+, -, \times, \div$) and know how to evaluate those functions at specific values analytically, numerically (given a table), and graphically (given a graph).
- Know how to find composite functions given each function, a table of values, or a graph of each function.
- Be able to find the domain of composite functions.

(5.2**) –** Inverse Functions and Their Representations (page 365)

- Know how to check if a function is one-to-one (and further, know what one-to-oneness means).
- Be able to find the inverse function of one-to-one functions (use the step by step process we went over in class with switching the x and y)
- Understand what it means for two functions to be inverses (know what inverse means)
- Know that when you compose a function with its inverse (and vice-versa) you get the input x.
- Understand what it means for two functions to be inverses in relation to their graphs (they are reflections across the line y=x)

(5.3**) –** Exponential Functions and Models (page 380)

- Know how to find the equation of an exponential function of the form $f(x) = Ca^x$ given a table of data.
- Know the formulas for:
  - Compound interest
  - Continuous compound interest
  - Radioactive decay
- Know how to use the above formulas (examples are given in the chapter section)

(5.4**) –** Logarithmic Functions and Models (page 399)

- Know the basic facts/properties about logarithms (i.e. they are the inverse of exponential functions, $\log_a 1 = 0$, $\log_a a = 1$, etc…)
- Understand what a logarithm is asking you ($\log_a x$ is asking: "to what power must a be raised in order to get x).
- Know how to solve simple logarithmic and exponential equations (using the fact that log functions and exponential functions are inverses).
- Be able to convert from exponential form to logarithmic form

(5.5**) –** Laws of Logarithms (LoLs) (page 415)

- Know the 4 LoL's and how to use them to expand or combine expressions.

(5.6**) –** Exponential and Logarithmic Equations (page 423)

- Know how to solve more complex logarithmic equations
- Know how to solve more complex exponential equations
- *Essentially, section 5.6 is all about solving equations utilizing the laws of logarithms in combination with the solving skills you learned in section 5.4*

(5.7**) –** Constructing Nonlinear Models (page 460)

- Know how to make a scatterplot of given data on your calculator
- Be able to determine the possible models that would model the scatterplot
- Understand how to choose the *best model* by checking correlation coefficient

(Additional Thoughts**)**

There are four main ways I suggest reviewing:

- Looking over past exams
- Doing the reviews (both online and the one the department provides)
- Looking through your notes
- Going through the book to sections you struggle with and doing some of the problems out of that sections "homework section"

Make sure you get enough sleep the night before the final!

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