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## Exam 2 Topics

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Disclaimer: This list may or may not be complete. I may have unintentionally forgot something. Please review your notes and the problems assigned for a complete idea of what to expect. Also note that some definitions come up in other sections. You should be able to apply definitions outside of the section in which they are listed when appropriate.

### 4.1: Nonlinear Functions (Polynomials)

- Definitions: polynomial function, degree, leading coefficient, absolute (global) maximum, absolute (global) minimum, local (relative) maximum, local (relative) minimum, even function, odd function
- Find the degree and leading coefficient of a polynomial
- Find extrema using the graph of a function
- Prove whether or not a function is even, odd, or neither
- Understand the symmetry involved in even and odd functions

### 4.2: Polynomial Functions and Models

- Definitions: turning point
- Understand the relationship between the degree of a polynomial and the number of  $x$ -intercepts and turning points
- Understand how the leading coefficient and degree affect the tail end behavior of polynomials and find the tail end behavior
- Perform cubic and quartic regression
- Graph piecewise functions where their components are basic polynomials

### 4.3: Polynomial Division

- Definitions: divisor, dividend, quotient, remainder
- Use the division algorithm to rewrite polynomials as products and sums of “lesser” polynomials
- Perform long and synthetic division
- Understand and use the Remainder Theorem

### 4.4: Real Zeros of Polynomial Functions

- Definitions: root/zero of a function, multiplicity
- Understand and use the Factor Theorem
- Understand and use the concept of Complete Factored Form of a polynomial
- Use zeros, multiplicity, and behavior near zeros to graph polynomials in complete factored form
- Use the Rational Roots Test in conjunction with long or synthetic division to write polynomials in complete factored form
- Use the Intermediate Value Theorem to conclude the existence of specific outputs

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#### 4.5: The Fundamental Theorem of Algebra

- Understand the Fundamental Theorem of Algebra and what it implies about the number of roots of a polynomial
- Understand and use the Conjugate Roots Theorem
- Completely factor any polynomial
- Find examples of polynomials satisfying specific conditions

#### 4.6: Rational Functions

- Definitions: rational function, vertical asymptote, horizontal asymptote
- Find vertical and horizontal asymptotes
- Find the domain of a rational function
- Graph rational functions
- Interpret what an asymptote means in an application

#### 4.7: Rational Equations and Variation

- Definition: directly proportional to (varies directly with) the  $n^{\text{th}}$  power of  $x$ , inversely proportional to (varies inversely with) the  $n^{\text{th}}$  power of  $x$
- Solve rational equations
- Solve applications/problems involving variation

#### 4.8: Radical Equations and Power Functions

- Definitions: power function
- Solving equations that involve any power of  $x$

#### 5.1: New Functions From Old

- Know how to add, subtract, multiply, and divide functions, and how to find the resulting functions domain.
- Know how to compose two functions, and how to find the resulting functions range.