

M105 Major Lecture Topics

*If there is a long list of learning objectives, the most critical topics will be given in **bold** text. Other topics will be mentioned, but not the focus of the lecture. If no bold text is given for a lecture, then all topics listed are of equal importance.

ALL of these topics are reviewed in the homework assignments. Most homework assignments also have 1 to 4 application/modeling/graphing questions that apply the techniques learned in a given section.

Sections 5.1, 5.2 (review) - Intro. & Multiplication of Polynomials

- Polynomial Terms and nomenclature
- Polynomial graph end behavior and leading coefficient test
- Evaluating polynomial functions
- **Adding and subtracting polynomials**
- **Multiplying polynomials**
 - Monomial * Monomial
 - Monomial * polynomial
 - Polynomial * polynomial
- **FOIL Method**
- **Square of Binomial Sum / Difference: $(A+B)^2$ $(A-B)^2$**
- **Product of Sum and Difference: $(A+B)(A-B)$**
- Function notation: $(f \pm g)(x)$, $(f \cdot g)(x)$

Section 5.3 - Greatest Common Factor & Grouping

- Factoring a monomial from a polynomial (GCF)
- Factoring by grouping

Section 5.4 A - Factoring Trinomials

- Factoring a trinomial whose leading coefficient is one
 - Trial and error method
 - Two variables: i.e. $x^2+2xy+y^2$
 - Trinomials with GCF
 - With substitution

*****variable exponents in homework 5.4a

Section 5.4 B - Factoring Trinomials

- Factoring a trinomial whose leading coefficient is not one
 - Trial and error method
 - Factoring by grouping method
 - Examples with GCF or substitution

Section 5.5 A - Factoring Special Forms

- Difference of Two Squares
- Perfect Square Trinomials
- Sum and Difference of Cubes

Section 5.5 B and 5.6 - Factoring Special Forms & Strategies

- From 5.5: Repeated Factorizations: i.e. x^8-1 or $x^2-6x+9-y^4$
- **Focus on strategies to identify which factorization technique**
- Mastery of factoring

Section 5.7 A (equations) - Polynomial Equations & Applications

- Standard Form of Quadratic Equation
- **Zero Product Principle**
- **Solving a quadratic equation**
- **Solving a polynomial equation**
- Using graphing techniques to verify solution

Section 5.7 B (applications) - Polynomial Equations & Applications

- Solving word problem strategies
- Modeling type questions, noting x & y intercepts, f(a) evaluation from graph
- Areas with borders
- Volumes from boxes with folded edges
- Triangles with Pythagorean theorem

**** remove question above excluded points in the domain 5.7.63 (9of21)

Section 6.1 - Rational Expressions: Multiplying and Dividing

- Rational Expressions & Functions nomenclature and definitions
- Evaluating rational functions and when answer does not exist
- Domain and Range of rational functions
- Vertical and horizontal asymptotes
- **Simplifying rational expressions** (and note removable discontinuities)
- **Multiplying rational expressions**
- **Dividing rational expressions**
- Note common mistakes of incorrectly dividing common terms: $(x+4)/x \neq 4$

Section 6.2 A - Rational Expressions: Adding and Subtracting

- Adding & subtracting rational expressions with common denominator
- Finding the LCD of rational expressions with different denominators
- Using the LCD to add/subtract rational expressions with different denominators
- Note: homework set for this section only requires simply factorizations in denominators and LCDs of no more than 3 binomial factors

Section 6.2 B - Rational Expressions: Adding and Subtracting

- **More complicated examples of adding/subtracting rational expressions**
- **Use this lecture to catch students up who are struggling with factoring, simplifying, finding LCDs for rational expressions**
- Homework problems contain:
 - More complicated factorizations in the denominator
 - Non-rational expressions added to rational expressions
 - Use of negatives to simplifying denominators, i.e.: $1/(y^2-36) + 1/(36-y^2)$
 - Adding/subtracting up to three rational expressions
 - Order of operations with multiplication and division in addition to adding rational expressions
 - FOILing rational expressions (or resolving summation in parentheses first)
 - Rational expressions with up to 4 variables
 - Rational expressions involving function notation

Section 6.3 - Complex Rational Expressions

- **Simplifying complex rational expressions**
 - Via multiplying numerator and denominator by LCD
 - Via dividing by denominator (multiplying by reciprocal)
- Negative exponential to rational form
- Evaluating function with a rational expression
- Application questions involving interest or resistors

Section 6.6 - Rational Equations

- Solving rational equations
 - List restrictions, Multiply whole equation by LCD, solve, reject excluded solutions
- Function evaluation of rational equations, modeling, interpreting graph
- Note the difference between rational expressions and equations

Section 6.7 A (formulas; some applications) - Rational Expressions: Applications & Formulas

- Solving rational formulas for a specified variable
- Examples involving average cost functions
- Examples with modeled equations

Section 6.7 B (applications) - Rational Expressions: Applications & Formulas

- Problems involving motion (rate, distance, time)
- Problems involving work-rate (filling pool, completing task, etc)
- Problems stating relation between numbers
- Note: MML homework sets sometimes assume students have been taught the table method from the textbook

Section 7.1 - Radical Expressions & Functions

- Square Roots
- Cube Roots
- Nth Roots (even and odd)
- For each of these:
 - Notation, domain, graphs, principle root vs negative root
 - Evaluating radical expressions / functions or not a real number
 - Simplifying root expressions (and when to use absolute value bars)

Section 7.2 - Rational Exponents

- Rational exponents in terms of radicals, $a^{1/n}$ or $a^{m/n}$
- Rewriting rational exponents in terms of radicals (and vice versa)
- Properties of rational exponent (i.e. review properties of exponents)
- Simplifying rational exponents (review what book/MML considers "simplified")

Section 7.3 - Multiplying & Simplifying Radical Expressions

- Product rule for radicals
- Simplifying radicals by factoring argument (helpful to review perfect nth powers)
- Multiply radicals and then simplify

Section 7.4 - Adding, Subtracting, Dividing Radical Expr.

- Adding and subtracting radical expressions (if like radicals)
- Quotient rule for radical expressions
- Simplifying radicals in order to be combined

Section 4.3 - Absolute Value Equations & Inequalities

- Equations involving absolute values (rewriting as an OR statement, solving)
- Inequalities with absolute values and graphing
 - Cases where solutions are \emptyset or \mathbb{R}

Section 4.4 - Linear Inequalities in Two Variables

- Review of graphing linear equation in two variables ($Ax+By=C$ or $y=mx+b$)
 - Review concept of coordinates being true/false or satisfying equation
- **Graphing linear inequality and shading half-plane that is true (w/ solid/dash line)**
 - With test points
 - Without test points
 - Vertical / horizontal half-planes & lines from inequalities
- **Systems of linear inequalities**
 - Cases with no solution, or infinite solutions

Section 8.1 - Square Root Property & Completing the Sqr.

- Square Root Property
- Solving equations via the square root property
 - Note: MML problems have been picked to not require rationalizing the denominator nor complex notation
- Completing the square
- Application questions (Pythagorean Theorem)

Section 8.2 - Quadratic Formula

- Developing the quadratic formula via completing the square is optional (but fun to do!)
- Quadratic Formula and solving problems
- Discriminant and graphical interpretations
- Creating quadratic equation from given solution

Section 8.3 - Quadratic Functions and their Graphs

- Basic parabolic graph of quadratic function
 - Vertex, axis of symmetry
 - Opens up or down
 - Horizontal and vertical shifting
 - Horizontal & vertical stretching and compression
 - Domain and range
- Acquiring equation from a graph of quadratic function
- Graphing quadratic functions of the form $f(x)=a(x-h)^2+k$
 - Finding coordinates of vertex
- Graphing quadratic functions of the form $f(x)=ax^2+bx+c$
 - Finding coordinates of vertex
- Finding maximum / minimum values
- Max / min application problems

Section 8.4 - Equations in Quadratic Form

- Quadratic forms and u-substitution
 - Forms where exponent is greater than 2
 - Different bases, such as binomials
 - Negative exponents
 - Rational Exponents