



Intermediate Algebra – Part 2

(Algebra 2)

Michigan State Mathematics Content Expectations

Course Description

Intermediate Algebra provides students with a solid foundation in algebra. The course introduces the basic concepts of graphing early and reinforces the areas of real numbers, solving equations and inequalities, exponents, and polynomials. The students will also encounter rational expressions, roots and radicals, and quadratic equation solving during their journey through the course. Geometric concepts are emphasized and integrated throughout.

Text Book

K. Elayne Martin-Gay. *Intermediate Algebra, Fourth Edition*. New Jersey: Pearson Prentice Hall, 2005.

Unit 1 Description

This unit will focus on rational expression.

Essential Content and Skills

The learner will:

- Find the domain of a rational expression.
- Simplify rational expressions.
- Multiply rational expressions.
- Divide rational expressions.
- Add or subtract rational expressions with common denominators.
- Identify the least common denominator of two or more rational expressions.
- Add or subtract rational expressions with unlike denominators.
- Simplify complex fractions by simplifying the numerator and denominator and then dividing.
- Simplify complex fractions by multiplying by a common denominator.
- Simplify expressions with negative exponents.
- Divide a polynomial by a monomial.
- Divide by a polynomial.
- Use synthetic division to divide a polynomial by a binomial.
- Use the remainder theorem to evaluate polynomials.
- Solve equations containing rational expressions.
- Solve an equation containing rational expression for a specified variable.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

- Solve problems by writing equations containing rational expressions.
 - Solve variation problems.
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Unit 1 Michigan State Content Expectations

[Click here to view the Michigan DOE Curriculum Content Standards.](#)

Unit 1 Lesson 1: Multiplying and Dividing Rational Expressions

State Standard	Description
A1.1.4	Add, subtract, multiply, and simplify polynomials and rational expressions.

Unit 1 Lesson 2: Adding and Subtracting Rational Expressions

State Standard	Description
A1.1.4	Add, subtract, multiply, and simplify polynomials and rational expressions.

Unit 1 Lesson 3: Simplifying Complex Fractions

State Standard	Description
L2.1.5	Add, subtract, and multiply complex numbers; use conjugates to simplify quotients of complex numbers.
A1.2.7	Solve exponential and logarithmic equations and justify steps in the solution.

Unit 1 Lesson 4: Dividing Polynomials

State Standard	Description
A1.1.5	Divide a polynomial by a monomial.
A1.2.5	Solve polynomial equations and equations involving rational expressions and justify steps in the solution.

Unit 1 Lesson 5: Dividing Polynomials

State Standard	Description
A1.1.5	Divide a polynomial by a monomial.
A1.2.5	Solve polynomial equations and equations involving rational expressions and justify steps in the solution.

Unit 1 Lesson 6: Synthetic Division and the Remainder Theorem

State Standard	Description
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Course Name - Part

Michigan State Curriculum Content Standards (continued)

A1.1.5 A1.2.5	Divide a polynomial by a monomial. Solve polynomial equations and equations involving rational expressions and justify steps in the solution.
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Unit 1 Lesson 7: Solving Equations Involving Radical Expressions

State Standard	Description
A1.2.5	Solve polynomial equations and equations involving rational expressions and justify steps in the solution.

Unit 1 Lesson 8: Solving Equations Involving Radical Expressions

State Standard	Description
A1.2.5	Solve polynomial equations and equations involving rational expressions and justify steps in the solution.

Unit 1 Lesson 9: Rational Equations and Problem Solving

State Standard	Description
A1.2.5	Solve polynomial equations and equations involving rational expressions and justify steps in the solution.
A1.2.8	Solve an equation involving several variables (with numerical or letter coefficients) for a designated variable, and justify steps in the solution.

Unit 1 Lesson 10: Variation and Problem Solving

State Standard	Description
A1.2.5	Solve polynomial equations and equations involving rational expressions and justify steps in the solution.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 2 Description

This unit will focus on rational exponents, radicals, and complex numbers.

Essential Content and Skills

The learner will:

- Find square roots.
 - Approximate roots using a calculator.
 - Find cube roots.
 - Graph square and cube root functions.
 - Use rules for exponents to simplify expressions that contain rational exponents.
 - Use rational exponents to simplify radical expressions.
 - Use the quotient and product rule for radicals.
 - Simplify radicals.
 - Add, subtract, and multiply radical expressions.
 - Rationalize numerators and denominators.
 - Solve equations that contain radical expressions.
 - Use the Pythagorean theorem to model problems.
 - Define imaginary and complex numbers.
 - Add or subtract complex numbers.
 - Multiply and divide complex numbers.
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Unit 2 Michigan State Content Expectations

Unit 2 Lesson 1: Radicals and Radical Functions

State Standard	Description
A1.2.7 A2.3.1	Solve exponential and logarithmic equations and justify steps in the solution. Identify a function as a member of a family of functions based on its symbolic or graphical representation; recognize that different families of functions have different asymptotic behavior.

Unit 2 Lesson 2: Rational Exponents

State Standard	Description
A1.2.7 A3.2.3	Solve exponential and logarithmic equations and justify steps in the solution. Apply properties of exponential and logarithmic functions.

Unit 2 Lesson 3: Simplifying Radical Expressions

State Standard	Description
A1.2.7 A3.2.3	Solve exponential and logarithmic equations and justify steps in the solution. Apply properties of exponential and logarithmic functions.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 2 Lesson 4: Adding, Subtracting, and Multiplying Radical Expressions

State Standard	Description
A1.2.7 A3.2.3	Solve exponential and logarithmic equations and justify steps in the solution. Apply properties of exponential and logarithmic functions.

Unit 2 Lesson 5: Adding, Subtracting, and Multiplying Radical Expressions

State Standard	Description
A1.2.7 A3.2.3	Solve exponential and logarithmic equations and justify steps in the solution. Apply properties of exponential and logarithmic functions.

Unit 2 Lesson 6: Rationalizing Denominators and Numerators of Radical Expressions

State Standard	Description
A1.2.7 A3.2.3	Solve exponential and logarithmic equations and justify steps in the solution. Apply properties of exponential and logarithmic functions.

Unit 2 Lesson 7: Rationalizing Denominators and Numerators of Radical Expressions

State Standard	Description
A1.2.7 A3.2.3	Solve exponential and logarithmic equations and justify steps in the solution. Apply properties of exponential and logarithmic functions.

Unit 2 Lesson 8: Radical Equations and Problem Solving

State Standard	Description
A1.2.7 A3.2.3	Solve exponential and logarithmic equations and justify steps in the solution. Apply properties of exponential and logarithmic functions.

Unit 2 Lesson 9: Radical Equations and Problem Solving

State Standard	Description
A1.2.7 A3.2.3	Solve exponential and logarithmic equations and justify steps in the solution. Apply properties of exponential and logarithmic functions.

Unit 2 Lesson 10: Complex Numbers

State Standard	Description
A1.2.7 A3.2.3	Solve exponential and logarithmic equations and justify steps in the solution. Apply properties of exponential and logarithmic functions.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 3 Description

This unit will focus on quadratic equations and functions.

Essential Content and Skills

The learner will:

- Use the square root property to solve quadratic equations.
- Solve quadratic equations by completing the square.
- Use quadratic equations to solve problems.
- Solve quadratic equations by using the quadratic formula.
- Determine the number and type of solutions of a quadratic equation by using the discriminant.
- Solve geometric problems modeled by quadratic equations.
- Solve various equations that are quadratic in form.
- Solve problems that lead to quadratic equations.
- Solve polynomial inequalities of degree 2 or greater.
- Solve inequalities that contain rational expressions with a variable in the denominator.
- Graph quadratic functions.
- Derive a formula for finding the vertex of a parabola.
- Find the minimum or maximum value of a quadratic function.

Unit 3 Michigan State Content Expectations

Unit 3 Lesson 1: Solving Quadratic Equations by Completing the Square

State Standard	Description
A1.2.8	Solve an equation involving several variables (with numerical or letter coefficients) for a designated variable. Justify steps in the solution. Convert quadratic functions from standard to vertex form by completing the square.
A3.3.3	

Unit 3 Lesson 2: Solving Quadratic Equations by Completing the Square

State Standard	Description
A1.2.8	Solve an equation involving several variables (with numerical or letter coefficients) for a designated variable. Justify steps in the solution. Convert quadratic functions from standard to vertex form by completing the square.
A3.3.3	

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 3 Lesson 3: Solving Quadratic Equations by the Quadratic Formula

State Standard	Description
A1.2.8	Solve an equation involving several variables (with numerical or letter coefficients) for a designated variable. Justify steps in the solution.
A3.3.3	Convert quadratic functions from standard to vertex form by completing the square.

Unit 3 Lesson 4: Solving Quadratic Equations by the Quadratic Formula

State Standard	Description
A1.2.8	Solve an equation involving several variables (with numerical or letter coefficients) for a designated variable. Justify steps in the solution.
A3.3.3	Convert quadratic functions from standard to vertex form by completing the square.

Unit 3 Lesson 5: Solving Quadratic Equations by using Quadratic Methods

State Standard	Description
A1.2.8	Solve an equation involving several variables (with numerical or letter coefficients) for a designated variable. Justify steps in the solution.
A3.3.3	Convert quadratic functions from standard to vertex form by completing the square.

Unit 3 Lesson 6: Nonlinear Inequalities in One Variable

State Standard	Description
A3.5.2	Understand the effects of degree, leading coefficient, and number of real zeros on the graphs of polynomial functions of degree greater than 2.

Unit 3 Lesson 7: Nonlinear Inequalities in One Variable

State Standard	Description
A3.5.2	Understand the effects of degree, leading coefficient, and number of real zeros on the graphs of polynomial functions of degree greater than 2.

Unit 3 Lesson 8: Quadratic Functions and Their Graphs

State Standard	Description
A3.3.1	Write the symbolic form and sketch the graph of a quadratic function given appropriate information.
A3.3.2	Identify the elements of a parabola (vertex, axis of symmetry, direction of opening) given its symbolic form or its graph, and relate these elements to the coefficient(s) of the symbolic form of the function.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 3 Lesson 9: Quadratic Functions and Their Graphs

State Standard	Description
A3.3.1	Write the symbolic form and sketch the graph of a quadratic function given appropriate information.
A3.3.2	Identify the elements of a parabola (vertex, axis of symmetry, direction of opening) given its symbolic form or its graph, and relate these elements to the coefficient(s) of the symbolic form of the function.

Unit 3 Lesson 10: Graphing Quadratic Functions

State Standard	Description
A3.3.1	Write the symbolic form and sketch the graph of a quadratic function given appropriate information.
A3.3.2	Identify the elements of a parabola (vertex, axis of symmetry, direction of opening) given its symbolic form or its graph, and relate these elements to the coefficient(s) of the symbolic form of the function.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 4 Description

This unit will focus on conic sections.

Essential Content and Skills

The learner will:

- Graph parabolas.
 - Use the distance formula and the midpoint formula.
 - Graph circles.
 - Write the equation of a circle, given its center and radius.
 - Find the center and the radius of a circle, given its equation.
 - Define and graph an ellipse.
 - Define and graph a hyperbola.
 - Solve a nonlinear system by substitution.
 - Solve a nonlinear system by elimination.
 - Graph a nonlinear inequality.
 - Graph a system of nonlinear inequalities.
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Unit 4 Michigan State Content Expectations

Unit 4 Lesson 1: The Parabola and the Circle

State Standard	Description
G1.7.1	Find an equation of a circle given its center and radius; given the equation of a circle, find its center and radius.
G1.7.2	Identify and distinguish among geometric representations of parabolas, circles, ellipses, and hyperbolas; describe their symmetries, and explain how they are related to cones.

Unit 4 Lesson 2: The Parabola and the Circle

State Standard	Description
G1.7.1	Find an equation of a circle given its center and radius; given the equation of a circle, find its center and radius.
G1.7.2	Identify and distinguish among geometric representations of parabolas, circles, ellipses, and hyperbolas; describe their symmetries, and explain how they are related to cones.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 4 Lesson 3: The Ellipse and the Hyperbola

State Standard	Description
G1.7.3	Graph ellipses and hyperbolas with axes parallel to the x - and y -axes, given equations.
P9.7	Know, explain, and apply the locus definitions of parabolas, ellipses, and hyperbolas and recognize these conic sections in applied situations.
P9.8	Identify parabolas, ellipses, and hyperbolas from equations, write the equations in standard form, and sketch an appropriate graph of the conic section.
P9.9	Derive the equation for a conic section from given geometric information (e.g., find the equation of an ellipse given its two axes). Identify key characteristics (e.g. foci and asymptotes) of a conic section from its equation or graph.
P9.10	Identify conic sections whose equations are in polar or parametric form.

Unit 4 Lesson 4: The Ellipse and the Hyperbola

State Standard	Description
G1.7.3	Graph ellipses and hyperbolas with axes parallel to the x - and y -axes, given equations.
P9.7	Know, explain, and apply the locus definitions of parabolas, ellipses, and hyperbolas and recognize these conic sections in applied situations.
P9.8	Identify parabolas, ellipses, and hyperbolas from equations, write the equations in standard form, and sketch an appropriate graph of the conic section.
P9.9	Derive the equation for a conic section from given geometric information (e.g., find the equation of an ellipse given its two axes). Identify key characteristics (e.g. foci and asymptotes) of a conic section from its equation or graph.
P9.10	Identify conic sections whose equations are in polar or parametric form.

Unit 4 Lesson 5: Mid-Unit 4 Review

State Standard	Description
G1.7.1	Find an equation of a circle given its center and radius; given the equation of a circle, find its center and radius.
G1.7.2	Identify and distinguish among geometric representations of parabolas, circles, ellipses, and hyperbolas; describe their symmetries, and explain how they are related to cones.
G1.7.3	Graph ellipses and hyperbolas with axes parallel to the x - and y -axes, given equations.
P9.7	Know, explain, and apply the locus definitions of parabolas, ellipses, and hyperbolas and recognize these conic sections in applied situations.
P9.8	Identify parabolas, ellipses, and hyperbolas from equations, write the equations in standard form, and sketch an appropriate graph of the conic section.
P9.9	Derive the equation for a conic section from given geometric information (e.g., find the equation of an ellipse given its two axes). Identify key characteristics (e.g. foci and asymptotes) of a conic section from its equation or graph.
P9.10	Identify conic sections whose equations are in polar or parametric form.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 4 Lesson 6: Solving Nonlinear Systems of Equations

State Standard	Description
P7.8	Represent and solve systems of inequalities in two variables and apply these methods in linear programming situations to solve problems.

Unit 4 Lesson 7: Solving Nonlinear Systems of Equations

State Standard	Description
P7.8	Represent and solve systems of inequalities in two variables and apply these methods in linear programming situations to solve problems.

Unit 4 Lesson 8: Nonlinear Inequalities and Systems of Inequalities

State Standard	Description
P7.8	Represent and solve systems of inequalities in two variables and apply these methods in linear programming situations to solve problems.

Unit 4 Lesson 9: Nonlinear Inequalities and Systems of Inequalities

State Standard	Description
P7.8	Represent and solve systems of inequalities in two variables and apply these methods in linear programming situations to solve problems.

Unit 4 Lesson 10: Nonlinear Inequalities and Systems of Inequalities

State Standard	Description
P7.8	Represent and solve systems of inequalities in two variables and apply these methods in linear programming situations to solve problems.