School District of Marshfield Course Syllabus

Course Name: Math 105 – Intermediate Algebra Honors
Length of Course: Fall Semester
Credit: 1/2

Program Goal:

The School District of Marshfield Mathematics Program will prepare students for college and career in the 21st century by ensuring ***all*** students learn based on skills and knowledge needed to succeed in post-secondary education/training, career, and life. The 4K through High School Mathematics curriculum is designed to support every student in achieving success. Students will be placed in to the driver's seat. Innovative educators will tailor instruction to student need through engaging learning activities and relevant assessment.

Course Description:

This course is the equivalent of Math 105 – Intermediate Algebra, in the University of Wisconsin system. Although not a college degree credit course, Intermediate Algebra reviews the topics needed to be mastered before taking College Algebra (Math 110), the Mathematics General Education Degree Credit course for most Bachelor degrees. Topics include the real number system, linear equations and inequalities, operations on polynomials and rational expressions, factoring, solutions of quadratic equations, Cartesian coordinates, functions, and related applications. Completion of this course with a C (not a C-) or better qualifies students to take College Algebra (Math 110) for High School Credit in the Spring Semester.

NOTE: This course is only offered in the Fall Semester. All students who sign-up for this course will sit for the UW System Mathematics Placement Exam. Cut scores determine course placement for eligibility to take College Algebra (Math 110) for College Credit in the Spring Semester.

PREREQUISITE: Senior Standing **and** Completion of Three Credits of High School Mathematics.

Standards:	
Wisconsin Standards for Mathematical Practice (MP)	
MP: 1, 2, 3, 4, 5, 6, 7, 8	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
Wisconsin Standards for Mathematics- Number and Quantity	
The Real Number System (N-RN)	
Extend the properties of exponents to rational exponents. N-RN: 1, 2	1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5(^{1/3})^3$ to hold, so $(5^{1/3})^3$ must equal 5.* 2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.
Wisconsin Standards for Mathematics- Algebra	
Seeing Structure in Expressions (A-SSE)	
Interpret the structure of expressions. A-SSE: 1a, 1b, 2	1. Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P.* 2. Use the structure of an expression to identify ways to rewrite it. *For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus*

	recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.
Write expressions in equivalent forms to solve problems. A-SSE: 3a, 3b, 3c	3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. a. Factor a quadratic expression to reveal the zeros of the function it defines. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. c. Use the properties of exponents to transform expressions for exponential functions. *For example, the expression* 1.15^t *can be rewritten as* $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ *to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*
Arithmetic with Polynomials and Rational Expressions (A-APR)	
Perform arithmetic operations on polynomials. A-APR: 1	1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
Understand the relationship between zeros and factors of polynomials. A-APR: 2, 3	2. Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$. 3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
Use polynomial identities to solve problems. A-APR: 6	6. Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system.
Rewrite rational expressions. A-APR: 7	7. (+)Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.
Creating Equations (A-CED)	
Create equations that describe numbers or relationships. A-CED: 1, 2, 4	1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.* 2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. 4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For*

	example, rearrange Ohm's law V =IR to highlight resistance R.
Reasoning with Equations and Inequalities (A-REI)	
Understand solving equations as a process of reasoning and explain the reasoning. A-REI: 1, 2	1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. 2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
Solve equations and inequalities in one variable. A-REI: 3, 4a, 4b	3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. 4. Solve quadratic equations in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form. b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.
Solve systems of equations. A-REI: 5, 6	5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. 6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
Represent and solve equations and inequalities graphically. A-REI: 12	12. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.
Wisconsin Standards for Mathematics- Functions	
Interpreting Functions (F-IF)	
Understand the concept of a function and use function notation. F-IF: 1, 2	1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$. 2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

Wisconsin Standards for Mathematics- Geometry	
Congruence (G-CO)	
Experiment with transformations in the plane. G-CO: 1, 2	1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. 2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
Expressing Geometric Properties with Equations (G-GPE)	
Translate between the geometric description and the equation for a conic section. G-GPE: 1	1. Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
Use coordinates to prove simple geometric theorems algebraically. G-GPE: 5	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).
Wisconsin Standards for Mathematics- Statistics and Probability	
Interpreting Categorical and Quantitative Data (ID)	
Interpret linear models. S-ID: 7	7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

Key Vocabulary:			
Sets of Real Numbers	Set Notation, and Interval Notation	Intersection and Union	Cartesian Coordinate system
Linear Equations/Inequalities	Linear Systems of Equations/Inequalities	Quadratic Equations	Polynomials
Rational Expressions/Equations	Absolute Value Equations/Inequalities	Midpoint Formula and Distance Formula	Pythagorean Theorem
Parallel and Perpendicular Lines	Slope-Intercept Form	Point-Slope Form	Standard Form both Linear and Quadratic
Elimination Method	Substitution Method	Cramer's Rule	Factor
Greatest Common Factor	Factoring by Grouping	Difference of Squares	Difference of Cubes
Sum of Cubes	Perfect Square Trinomial	Completing the Square	Square Root Principle
One Solution	No Solution	Infinitely Many Solutions	Extraneous Roots
Relation	Function	Domain	Range
Composite Functions	One-to-one Functions	Inverse Functions	Exponential Functions

Logarithmic Functions	Function Notation	Simplest Radical Form	

Topics/Content Outline- Units and Themes:

Quarter 1:

- Perform Operations with real numbers
- Solve equations and inequalities
- Use Cartesian coordinate system
- Algebraic relations and functions
- Solve systems of linear equations and inequalities

Quarter 2:

- Perform operations with polynomials
- Perform operations on rational expressions and equations
- Solve Radical equations
- Solve quadratic equations
- Apply properties of exponential and logarithmic functions

Primary Resource(s):

Intermediate Algebra for College Students, 7th Edition Prentice Hall ISBN: 0-132-38357-8 © 2007	Math XL, Pearson Realize