The Mathematics Program

Algebra II/Trig

Grades: 9-12

Length: Year

Prerequisites: Geometry and teacher recommendation

Special Requirements: Graphing calculator
TI-84 (preferred) or TI-83 (acceptable)

Competency Goal 1:
The learner will simplify perform operations on mathematical expressions.

1.01 Simplify and perform operations with rational exponents and logarithms (common and natural) to solve problems.
   • Includes zero and negative exponents.
   • Simplify rational expressions.
   • Convert expressions from radical form to/from index form.
   • Convert between logarithmic form and exponential form.
   • Condense, expand and simplify logarithmic expressions.
   • Evaluate logs of any base using change of base formula.

1.02 Define and compute with complex numbers.
   • Simplifying rational expressions with complex numbers.
   • Simplify complex fractions.
   • Add, subtract, multiply and divide complex numbers.
<table>
<thead>
<tr>
<th>1.03</th>
<th>Operate with rational expressions to solve problems.</th>
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<tbody>
<tr>
<td></td>
<td>• Finding greatest common factor and least common multiple.</td>
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<td></td>
<td>• Adding, subtracting, multiplying, dividing and simplifying rational expressions.</td>
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<td></td>
<td>• Simplify expressions involving the exponent zero.</td>
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<tr>
<td></td>
<td>• Simplify expressions involving negative exponents.</td>
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<tr>
<td></td>
<td>• Add and subtract rational expressions.</td>
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<td>• Simplify complex fractions.</td>
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<tr>
<th>1.04</th>
<th>Perform operations with polynomial expressions and equations</th>
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<tr>
<td></td>
<td>• Distinguish between polynomials and non-polynomials.</td>
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<td>• Identify the degree and leading coefficient of a polynomial.</td>
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<td>• Simplify polynomial expressions.</td>
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<td>• Find the prime factorization of integers.</td>
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<td>• Factor Polynomials</td>
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<th>1.05</th>
<th>Operate with matrices to model and solve problems.</th>
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<tr>
<td></td>
<td>• Identify rows, columns, elements and dimensions of matrices.</td>
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<td>• Identify “special matrices” i.e. row, column, square and zero matrices.</td>
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<td>• Solve for missing elements when given equal matrices.</td>
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<td>• Add, subtract and multiply matrices.</td>
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<td>• Calculate the determinant for a 2 x 2 and 3 x 3 matrix both with and without calculator.</td>
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<td>• Calculate the inverse of a 2 x 2 matrix by hand.</td>
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<td>• Use matrices to solve systems of equations.</td>
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<th>1.06</th>
<th>Perform and operations with radical expressions to solve problems</th>
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<td></td>
<td>• Simplify radical expressions.</td>
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<tr>
<td></td>
<td>• Add and subtract radical expressions.</td>
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<td></td>
<td>• Multiply and divide binomials containing radicals.</td>
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</table>
### Competency Goal 2:
The learner will use relations and functions to solve problems.

#### 2.01 Use the composition and inverse of functions to model and solve problems; justify results.
- Linear and Quadratic Functions
- Identify symmetry
- Determine whether a function is odd or even both graphically and algebraically.
- Identify the inverse of a function both algebraically and graphically
- Interpret domain and range in the context of the problem
- Identify and interpret slope as a rate of change in the context of the problem

#### 2.02 Use functions and inequalities to model and solve problems; justify results.
- Investigate the relationship between tables, graphs, and algebraic properties.
- Interpret the constants and coefficients in the context of the problem.
- Solve growth and decay problems using exponential and log function models

#### 2.03 Use exponential and logarithmic functions to model and solve problems; justify results.
- Investigate the relationship between tables, graphs, and algebraic properties.
- Interpret the constants and coefficients in the context of the problem.

#### 2.04 Use rational functions to model and solve problems; justify results.
- Investigate the relationship between tables, graphs, and algebraic properties.
- Interpret the constants and coefficients in the context of the problem.
- Identify the asymptotes and intercepts graphically and algebraically.
- Includes adding, subtracting multiplying and dividing rational expressions.
- Graph rational functions.

#### 2.05 Use polynomial functions to model and solve problems.
- Investigate the relationship between tables, graphs, and algebraic properties.
- Interpret constants and coefficients in the context of the problem.
- Use synthetic division to find zeros of higher order polynomials.

Adopted by the Board on Jan 30, 2007
- Determine the number of roots a function.
- Use rational roots theorem to find zeros of polynomials.
- Describe the end behavior of polynomial functions.
- Describe the number of turns of a polynomial function.
- Sketch the graph of a polynomial function.

### 2.06 Explore transformations of parent functions
- Investigate translations, reflections and scale change of constant, linear, quadratic, cubic, absolute value, inverse, inverse square, square root, exponential growth and decay, sine, cosine and tangent functions

### 2.07 Model and solve problems using the six trigonometric functions.
- Includes both degree and radian measure.
- Identify: standard position, reference angles, co-terminal angles and quadrant location.
- Evaluate the six trigonometric ratios for specific radian and degree measures.
- Define the 6 trigonometric functions in terms of the unit circle.
- Explore the relationship between the unit circle and the graphs of sine and cosine functions.
- Determine angles by using inverse trig functions.
- Model and solve real-world applications using sine and cosine functions.
- Identify the period, amplitude and phase shift of a sine or cosine function.
- Graph and analyze a single period of sine, cosine, and tangent functions.
- Simplify trigonometric expressions and ratios by applying the fundamental trigonometric identities.
- Verify trigonometric identities by applying the fundamental identities.
- Use technology such as calculators, java applets and geometers sketchpad to explore trig functions.

### 2.08 Use conic sections, both on and off the origin, to model and solve problems; justify results.
- Investigate the relationship between tables, graphs, and algebraic properties.
- Interpret the constants and coefficients.
- Find the equation of a conic given its graph.
- Draw the graph of a conic given its equation.
- Model and solve real world applications.
- Rewrite in standard form using completing the square.
Competency Goal 3: The learner will solve algebraic equations.

3.01 Solve equations and inequalities in one variable
- Model data by writing an algebraic equation or inequality in one or more variables.
- Solve using tables, graphs, and algebraic properties.
- Solve exponential equations.
- Solve exponential equations by expressing both sides as expressions with the same base.
- Solve log equations using logarithmic properties.
- Solve polynomial equations using factoring and zero-product property.

3.02 Use equations with radicals to model and solve problems; justify results.
- Investigate the relationship between tables, graphs, and algebraic properties.
- Interpret the degree, constants, and coefficients in the context of the problem.
- Solve equations containing radicals.

3.04 Use systems of two or more equations or inequalities to model and solve problems; justify results. Solve using tables, graphs, matrix operations, and algebraic properties.
- Emphasis on real world models

3.05 Model and solve problems using direct, inverse, combined and joint variation.

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