

# COMMUNITY UNIT SCHOOL DISTRICT 200

## Algebra 2 and Trigonometry High School Intermediate Level - Two Semesters

- 1. Subject Expectation (State Goal 6)**      **The student will demonstrate and apply a knowledge and sense of numbers, including numeration and operations (addition, subtraction, multiplication, division), patterns, ratios and proportions.**

<b>Essential Learning 1 (Learning Standard A)</b>	<b>Demonstrate knowledge and use of numbers and their representations in a broad range of theoretical and practical settings</b>
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| Critical Content | 6.A.5 | a. | perform addition, subtraction and multiplication of complex numbers and graph the results in the complex plane   |
|                  |       |    | <ul style="list-style-type: none"><li>• add, subtract, and multiply complex numbers</li></ul>  |
|                  | *     |    | <ul style="list-style-type: none"><li>• include complex numbers as solutions to quadratic equations that do not have real solutions</li><li>• graph and interpret the graph of a complex number</li><li>• solve problems using complex numbers</li></ul> |

<b>Essential Learning 2 (Learning Standard B)</b>	<b>Investigate, represent and solve problems using number facts, operations (addition, subtraction, multiplication, and division) and their properties, algorithms and relationships</b>
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| Critical Content | 6.B.5 | a. | identify, represent and apply numbers expressed in exponential, logarithmic and scientific notation using contemporary technology   |
|                  |       |    | <ul style="list-style-type: none"><li>• solve problems using:<ul style="list-style-type: none"><li>- exponents</li><li>- -logarithms</li><li>- -scientific notation</li></ul></li><li>• apply the laws of exponents</li></ul> |

<b>Essential Learning 3 (Learning Standard D)</b>	<b>Solve problems using comparison of quantities, ratios, proportions and percents</b>
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| Critical Content | 6.D.5 | a. | solve problems involving loans, mortgages and other practical applications involving geometric patterns of growth  |
|                  |       |    | <ul style="list-style-type: none"><li>• explain the connection of percents to growth patterns</li><li>• solve applications such as<ul style="list-style-type: none"><li>- growth</li><li>- decay</li></ul></li><li>• set up and solve proportions for direct variation</li></ul> |

**2. Subject expectation (State Goal 7)**      **The student will estimate, make and use measurements of objects, quantities and relationships and determine acceptable levels of accuracy.**

<b>Essential Learning 1 (Learning Standard A)</b>	<b>Measure and compare quantities using appropriate units, instruments and methods</b>
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Critical Content      7.A.5 a. apply nonlinear scales (e.g., Richter, decibel, pH) to solve practical problems

- analyze relationships using exponential and logarithmic regression
- graph exponential and logarithmic functions

**3. Subject expectation (State Goal 8)**      **The student will use algebraic and analytical methods to identify and describe patterns and relationships in data, solve problems and predict results.**

<b>Essential Learning 1 (Learning Standard A)</b>	<b>Describe numerical relationships using variables and patterns</b>
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Critical Content      8.A.5 a. solve mathematical problems involving recursive patterns and use models that employ such relationships

- generalize patterns using explicitly defined and recursively defined sequences
- translate between explicit and recursive forms of sequences
- determine whether a sequence is arithmetic or geometric
- find infinite sums of converging series
- find partial sums of series

<b>Essential Learning 2 (Learning Standard B)</b>	<b>Interpret and describe numerical relationships using tables, graphs and symbols</b>
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Critical Content      8.B.4a a. represent algebraic concepts with physical materials, words, diagrams, tables, graphs, equations, and inequalities and use appropriate technology.

- graph and write equations of lines using
  - slope-intercept
  - point-slope
  - standard form
- solve and graph linear equations and inequalities
- graph absolute value functions
- solve literal equations

8.B.5 b. Use functions including exponential, polynomial, rational, parametric, logarithmic, and trigonometric to describe numerical relationships

- fit an equation to data using a calculator
- interpret the relationships of two variables and connect it to a
  - -linear function
  - -quadratic function
  - -exponential function
  - -logarithmic function

- from a graph
- analyze functions and their behaviors by investigating
  - domain
  - range
  - rates of change
  - intercepts
  - zeros
  - asymptotes
- graph and identify domain and range of
  - functions/relations
  - radical functions
  - compound functions
- find inverse functions of radicals
- analyze graphs of rational functions
- find discontinuities using asymptotes and holes
- solve and apply inverse variation
- simplify rational exponents
- identify function notation
- perform addition, subtraction, multiplication, division, and composition of functions
- determine types of solutions of quadratic equations
- solve application problems such as:
  - maximum and minimum problems

<b>Essential Learning 3 (Learning Standard C)</b>	<b>Solve problems using systems of numbers and their properties</b>
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| Critical Content | 8.C.4.a | a. analyze and report the effects of changing coefficients, exponents and other parameters on functions and their graphs <ul style="list-style-type: none"> <li>• solve a system of equations using             <ul style="list-style-type: none"> <li>- graphing</li> <li>- elimination</li> <li>- substitution</li> </ul> </li> <li>• explore a variety of functions including             <ul style="list-style-type: none"> <li>- linear</li> <li>- exponential</li> <li>- quadratic</li> <li>- inverse</li> <li>- absolute value</li> </ul> </li> <li>• solve systems of inequalities</li> </ul> |
| 8.C.4.b          | b.      | apply algebraic properties and procedures with matrices, vectors, functions and sequences using data found in business, industry and consumer situations <ul style="list-style-type: none"> <li>• add, subtract and multiply matrices</li> <li>• solve systems of equations using matrices</li> </ul>   |
| 8.C.5            | c.      | use polynomial, exponential, logarithmic and trigonometric functions to model situations <ul style="list-style-type: none"> <li>• describe and compare the properties of functions including             <ul style="list-style-type: none"> <li>- exponential</li> <li>- logarithmic</li> <li>- periodic</li> </ul> </li> </ul>   |

- explain the relationships between
  - arithmetic/geometric sequences
  - linear/exponential functions
- evaluate logarithmic expressions
- define and use base e and natural logarithms
- recognize and apply properties of logarithms

<b>Essential Learning 4 (Learning Standard D)</b>	<b>Use algebraic concepts and procedures to represent and solve problems</b>
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| Critical Content | 8.D.5 | a. formulate and solve nonlinear equations and systems including problems involving inverse variation and exponential and logarithmic growth and decay <ul style="list-style-type: none"> <li>• solve problems using             <ul style="list-style-type: none"> <li>- linear programming</li> <li>- equations of exponential growth</li> <li>- equations of logarithmic growth</li> </ul> </li> </ul> |
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<b>4. Subject expectation (State Goal 9)</b>	<b>The student will use geometric methods to analyze, categorize and draw conclusions about points, lines, planes and space.</b>
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<b>Essential Learning 1 (Learning Standard D)</b>	<b>Use trigonometric ratios and circular functions to solve problems</b>
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| Critical Content | 9.D.5 | a. analyze and solve problems involving periodic patterns (e.g., sound waves, tide variations) using circular functions and communicate results orally and in writing <ul style="list-style-type: none"> <li>• solve application problems such as             <ul style="list-style-type: none"> <li>- right triangle trigonometry</li> <li>- Law of Sines</li> <li>- Law of Cosines</li> </ul> </li> <li>• convert between radian and degree measures</li> <li>• determine reference angle given the angle of rotation</li> <li>• identify the fundamental trigonometric identities             <ul style="list-style-type: none"> <li>- ratio identities</li> <li>- reciprocal identities</li> <li>- Pythagorean identities</li> </ul> </li> <li>• use inverse trigonometric functions to find angle measures</li> <li>• graph sine and cosine functions using characteristics such as             <ul style="list-style-type: none"> <li>- period</li> <li>- amplitude</li> </ul> </li> <li>• develop and use the unit circle (radians and degrees)</li> </ul> |
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<b>5. Subject expectation (State Goal 10)</b>	<b>The student will collect, organize and analyze data using statistical methods; predict results; and interpret uncertainty-using concepts of probability.</b>
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**Essential Learning 1  
(Learning Standard A)**

**Organize, describe and make predictions from existing data**

- Critical Content      10.A.4c    a.    predict from data using interpolation, extrapolation and trend lines, with and without the use of technology
- explore and analyze relations using
    - linear regression
    - exponential regression
    - logarithmic regression
  - predict and estimate values given a set of data
  - find an equation of a line using
    - best-fit line from data
    - $y = key$
  - write the equation of the line of best fit from data

**Essential Learning 2  
(Learning Standard C)**

**Determine, describe and apply the probabilities of events**

- Critical Content      10.C.5b    a.    compute probabilities in counting situations involving permutations and combinations
- set up and solve permutation and combination problems
  - fundamental counting principle