

Algebra 2 Honors Curriculum Guide

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| Course Number: | 311 |
| Level: | Honors |
| Textbook: | <u>Algebra 2, Applications, Equations and Graphs, McDougal Littell, 2001</u> |
| Credit: | 5.0 credits |
| Revised: | August 2008 |
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| Midterm Exam Revised: | January 2008 |
| Final Exam revised: | June 2008 |

Prerequisite

Students enrolling in this course must have completed Geometry Honors with at least a “C” average. Students from Algebra 1 Academic may enroll in this course if they have an “A” average in Algebra 1 Academic, teacher recommendation and take Geometry (Academic or Honors) concurrently.

Course Description

This course is designed for students who have demonstrated exceptional ability and motivation in mathematics and will meet the needs of students who anticipate entering college majors requiring an extensive mathematical background.

The content of this course reflects the NCTM Standards. The concept of a function is used as a unifying theme throughout the course. Graphing and the relationship between graphs and equations is emphasized. Algebra is connected to other areas of mathematics such as geometry, data analysis, probability and discrete mathematics. Problem solving and application to real world problems are integrated throughout the course.

Teaching strategies used in this course follow the recommendations of the National Council of Teachers of Mathematics. Students are expected to be active participants in the learning process. The teacher will involve them in the introduction and development of material through exploratory activities, questioning and class discussions. Understanding of concepts is stressed rather than rote memorization of skills. When appropriate, students are guided in discovering the concepts themselves through a study of patterns and relating their work to prior knowledge. The graphing calculator is essential to this course as students use it both to discover concepts and strengthen their understanding of concepts.

Course Objectives

Students will be able to:

1. solve linear and quadratic equations and inequalities and systems of equations and inequalities.
2. identify relations and functions and their graphs and transformations and explain their properties (this includes polynomial, rational, exponential and logarithmic functions).
3. perform operations with exponents, roots, radicals, polynomials, and matrices.
4. identify and write equations for conic sections (circle, ellipse, hyperbola and parabola) and identify their properties.
5. use measures of central tendency and the normal curve to describe sets of data.
6. use the counting principle, permutations and combinations to determine the number of ways an event can happen; calculate the probability of an event.
7. use trigonometric functions to solve real-world problems.
8. use all concepts to model problems.

Course Policies

Homework will be given almost every day and is an important part of the course, providing students the opportunity to apply skills learned in class, strengthen their understanding of the concepts, and identify areas they don't understand. It is imperative that students do homework regularly and conscientiously. Homework will be reviewed in class and it is the student's responsibility during that time to ask questions about problems he/she doesn't understand, to identify specific mistakes, and to take notes on any further explanation concerning these problems. Some of the homework will be based on the sample problems done in class and students are expected to study these examples and use them as a guide when doing their homework. Other problems will require students to extend the concepts learned in class to new situations. Students will also be given reading assignments either to preview material that will be taught the next day or to learn new concepts and procedures independently.

Students will be responsible to make up any missed class work (test, quiz, homework) in a timely manner, according to teacher established policies. Policies will be discussed in class. It is the student's responsibility to obtain material (notes, homework) for any extended absence and meet with the teacher upon return to class.

Student Evaluation

One to three quizzes, based on the course proficiencies, will be given during a unit and a unit test will be given at the end of each unit. Group or individual projects or explorations may also be used as quiz grades. An exam will be given at the end of each semester, covering all the work of that semester. Notebooks will be collected and graded. The teacher will explain what is expected in notebooks and when they will be collected. Take home quizzes or tests may be also be assigned.

Homework will be checked daily. It will usually not be graded, but will be considered satisfactory if the work shown indicates the student has made a conscientious effort to complete the assignment. Sometimes an assignment given for homework may be collected and graded as a quiz. Students will be informed ahead of time about these assignments.

Grades will be calculated according to the school grading policy and the following guidelines.

A. Marking Period Grade

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| 1. Tests and Quizzes | 90 - 95% |
| 2. Homework (Each teacher will explain his/her policy to the class) | 05 - 10% |
| 3. Class Participation | 00 - 05% |
| 4. Notebooks are required, and will be graded as a quiz or test | |

B. Final Grade

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| 1. Each Marking Period Grade | 20% |
| 2. Mid-term Exam | 10% |
| 3. Final Exam | 10% |

Notes to Teachers

The proficiencies, not the textbook, are to be used as a guide for the course. At the end of the proficiencies for each unit is a list of resources. The textbook is the major resource and is listed first. The Resource Book for each chapter and Practice Workbook are resources coordinated with the textbook. Internet support is available and coordinated with the text at www.mcdougallittell.com. The teacher access code is: MCD9JDFP8MZT8. A teacher can access both teacher only and student resources. A student can access internet resources at the same web site with student access code: MCDX5KYPV55YV. There are other activities listed from the Mathematics Teacher. Copies of these activities are attached at the end of the Curriculum Guide.

Graphing calculators are to be used throughout the course to explore and strengthen understanding of concepts. Numerous activities are presented in the teachers= edition of the textbook. The teacher should integrate as many of these as possible into the course. Alternate activities may also be found in the graphing calculator resource books we have available in the department library.

Assessments should include a variety of problems. They should test a student's ability to communicate mathematically and solve problems as well as perform mathematical calculations. They should include writing, open-ended questions, performance tasks and reflect use of the graphing calculator. The Assessment Book coordinated with the text book provides a variety of sample questions. Suggestions for group or individual projects are included in the teacher's edition of the textbook and should also be used as an assessment too.

District Policy: Academic Integrity

Pupils are expected to be honest in all of their academic work. This means that the students in this course will not engage in any of the following acts:

- Cheating on examinations or other school assignments, including but not limited to, the non-authorized use of books or notes, the use of crib sheets, copying from other students' papers, exchanging information with other students orally, in writing, or by signals, obtaining copies of the examination illegally and other similar activities. Cheating through the use of technology to exchange information on any school assignment, examination, etc. is prohibited. Technology is defined as, but not limited to, computers, telephones, text messaging, palm pilots, calculators, cameras or any other hand held device.
- Plagiarism is not permitted in term papers, themes, essays, reports, images, take-home examinations, and other academic work. Plagiarism is defined as stealing or use without acknowledgment of the ideas, words, formulas, textual materials, on-line services, computer programs, etc. of another person, or in any way presenting the work of another person as one's own.
- Falsifications, including forging signatures, altering answers after they have been graded, inserting answers after the fact, erasing of grader's markings, and other acts that allow for falsely taking credit.

A pupil found guilty of academic dishonesty may be subjected to a full range of penalties including, but not limited to reprimand and loss of credit for all of the work that is plagiarized. Disciplinary action may also be a consequence of such behavior. Additional consequences may apply as defined in specific department policies and guidelines.

A teacher who believes that a pupil has been academically dishonest in his/her class should resolve the matter in the following manner:

- Reprimand the student orally and/or in writing. The teacher is also authorized to withhold credit in the work due to academic dishonesty.
- If warranted, the teacher shall file a written complaint against the student with the Administration, requesting a more stringent form of discipline. The complaint must describe in detail the academic dishonesty that is alleged to have taken place, and must request that the matter be reviewed by the Administration.
- The Administration will determine if further discipline of the pupil is appropriate, and will determine the nature of the discipline on a case-by-case basis.

- If the pupil is not in agreement with the disciplinary action of the Administration, he/she may appeal the action first to the Principal and secondly to the Superintendent. If the pupil is dissatisfied with the Superintendent's disposition of the case, he/she may grieve the action in accordance with Policy No. 5710, Pupil Grievance.

Equity Statement

High Point Regional High School's curriculum and instruction are aligned with New Jersey Core Curriculum Content Standards and address the elimination of discrimination by narrowing the achievement gap, by providing equity in educational programs and by providing opportunities for students to interact positively with others regardless of race, creed, color, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, religion, disability, or socio-economic status.

Course Proficiencies

Unit 1: Equations and Inequalities

Time: 12 days

Unit Goal(s): Students will be able to evaluate and simplify numerical and algebraic expressions, solve linear and absolute value equations and inequalities, and use algebra to model and solve real-life problems.

Unit Objectives:

Students will be able to:

1. graph, order, identify properties and perform operations with real numbers.
2. solve and graph linear and absolute value equations and inequalities.
3. rewrite and apply equations and formulas with more than one variable.
4. use problem solving strategies to write and use algebraic models to solve real-life problems.

New Jersey Core Curriculum Content Standards (CCCS):

4.1 A. 1,2,3; 4.1 B 1; 4.3 C.1, D 2,3 See list at end of guide.

References

1. Textbook, Chapter 1
2. Chapter 1 Resource Book
3. Practice Workbook with Examples Chapter 1 pgs. 1-21

Unit 2: Linear Equations and Functions

Time: 14 days

Unit Goal(s): Students will be able to graph relations, functions (including piecewise), equations and inequalities in 2 variables and absolute value functions, write equations of lines and solve real-life problems using graphs and equations.

Unit Objectives:

Students will be able to:

1. represent, graph and evaluate relations and functions.
2. find and use slope of a line.
3. write linear and direct variation equations.
4. use a scatter plot to identify correlation for a set of data and approximate the best fitting line with and without technology.
5. graph linear equations, inequalities and functions with and without technology.
6. make predictions about linear data.
7. classify parallel and perpendicular lines.
8. use slope-intercept and standard forms of linear equations.
9. use all types of functions to model real-life situations.

CCCS: 4.3 B 1,2 C 1,2; 4.3 B 2 See list at end of guide.

References

1. Textbook, Chapter 2
2. Chapter 2 Resource Book
3. *Exploring Regression with a Graphing Calculator*, Mathematics Teacher, December, 1993
4. Practice Workbook with Examples Chapter 2 pgs.22-45

Unit 3: Systems of Linear Equations and Inequalities

Time: 14 days

Unit Goal(s): Students will be able to write and solve linear systems in 2 or 3 variables by graphing and algebraic methods and apply to real-life problems.

Unit Objectives:

Students will be able to:

1. solve systems in 2 variables by graphing, by substitution, or combination method.
2. write and solve systems of inequalities by graphing and apply the concepts of constraints, feasible region, and objective function to solve

- linear programming problems.
3. solve systems of linear equations in 3 variables algebraically.
 4. use systems and linear programming to solve real-life problems.

CCCS: 4.3 B 1,2; 4.5 A 1,2,3,4; C 1,2,3 See list at end of guide.

References

1. Textbook, Chapter 3 omit 3.5
2. Linear Programming Worksheets (group project), attached.
3. Chapter 3 Resource Book
4. Practice workbook with Examples pgs.46-63

Unit 4: Matrices and Determinants

Time: 11 days

Unit Goal(s): Students will be able to add, subtract, and multiply matrices and solve linear systems using inverse matrices and technology.

Unit Objectives:

Students will be able to:

1. add and subtract matrices and multiply by a scalar.
2. multiply 2 matrices with and without technology.
3. find and use inverse matrices.
4. solve systems using inverse matrices with technology.

CCCS: 4.1 B 3

References

1. Textbook, Chapter 4 omit 4.3
2. Activity 4.4 in Text pg. 222
3. Chapter 4 Resource Book
4. Project: Olympic Regression pg. 90 Chapter 4 Resource Book
5. Practice Workbook with Examples pgs. 64-78

Unit 5: Quadratic Functions

Time: 16 days

Unit Goal(s): Students will be able to solve quadratic equations using a variety of methods and graph quadratic functions and inequalities.

Unit Objectives:

Students will be able to:

1. recognize quadratic relationships in real world situations.
2. graph quadratic equations using translations of the parent function, $y = ax^2$.
3. factor quadratic expressions, including factoring the sum and difference of two cubes.
4. solve quadratic equations using a graphing calculator, factoring, completing the square, the square root method and the Quadratic Formula.
5. use the discriminant to determine the number and types of solutions a quadratic equation has.
6. find the zeros of a quadratic function.
7. solve quadratic equations with complex solutions and perform operations with complex numbers.
8. write quadratic functions given characteristics of their graphs.

CCCS: 4.3 B 3, C1, D 2,3 See list at end of guide

References

1. Textbook, Chapter 5 omit 5.7
2. Practice Workbook with Examples pgs. 79-102
3. Chapter 5 Resource Book

Unit 6: Polynomials and Polynomial Functions

Time: 17 days

Unit Goal(s): Students will be able to perform operations on polynomial functions and solve polynomial equations. They will know how to evaluate, graph, and find zeros of polynomial functions.

Unit Objectives:

Students will be able to:

1. use properties of exponents, including scientific notation to simplify and evaluate expressions.
2. evaluate, graph, add, subtract, and factor polynomial expressions.
3. use factoring to solve polynomial equations including the sum and difference of cubes.
4. divide polynomials by long division and synthetic division and apply to the remainder and factor theorems.
5. find rational zeros of a function and use the fundamental theorem of algebra to determine the number of zeros.
6. analyze graphs of polynomial functions and apply to real-life situations.
7. use finite differences to determine the degree of a polynomial function that will fit a set of data.

CCCS: 4.1 B 2,4; 4.3 B 1,2,4 C 1; D 1,2,3; 4.5 F 1,3 See list at end of guide.

References

1. Textbook, Chapter 6
2. Practice Workbook with Examples pgs. 103-129
3. Project pgs. 396-397 in text
4. Chapter 6 Resource Book

Unit 7: Powers, Roots, and Radicals

Time: 15 days

Unit Goal(s): Students will be able to find and use rational exponents and nth roots, perform operations with and find inverses of functions, and graph radical functions and solve radical equations.

Unit Objectives:

Students will be able to:

1. evaluate nth roots of real numbers using both radical and rational expressions.

- notation.
2. use properties of rational exponents to evaluate and simplify expressions.
 3. perform operations with functions including power functions.
 4. find inverses of linear and nonlinear functions.
 5. graph square root and cube root functions.
 6. solve equations that contain radical or rational exponents.
 7. use power functions, inverse functions and radical functions to solve real-life problems.
 8. use measures of central tendency and measures of dispersion to describe data sets.
 9. use box-and-whisker plots and histograms to represent data graphically.
 10. identify different types of sampling and identify biased samples.

CCCS: 4.1 B 2, 4; 4.4 A 1, 2, 5; 4.5 F1, 3, 4 See list at end of guide.

References:

1. Textbook, Chapter 7
2. Activity 7.4 pg. 421 in text
3. Activity 7.7 pg. 453 in text
4. Practice Workbook with Examples pgs. 130-150
5. Chapter 7 Resource Book
6. Material on types of sampling must be included by teacher.

Unit 8: Exponential and Logarithmic Functions

Time: 16 days

Unit Goal(s): Students will be able to graph and use exponential, logarithmic and logistic growth functions. They will be able to use the number e and the definition and properties of logs, and solve exponential and logarithmic equations.

Unit Objectives:

Students will be able to:

1. graph exponential growth, decay and natural base functions.
2. evaluate and simplify exponential expressions with base e and logarithmic expressions.
3. graph logarithmic functions and use properties of logs.
4. solve exponential and logarithmic equations.
5. model data with exponential and power functions.
6. evaluate and graph logistic growth functions.
7. use exponential logarithmic, and logistic growth functions to model real-life situations.

CCCS: 4.3 B 1,2,3,4 C 1,3; 4.5 F 1,3,4 See list at end of guide.

References:

1. Textbook, Chapter 8
2. Practice Workbook with examples pgs. 151-174
3. Chapter 8 Resource Book
4. Internet activity (www.exploremath.com) LOG FNS- attached at end of guide.

Unit 9: Rational Equations and Functions

Time: 14 Days

Unit Goal(s): Students will be able to: simplify and perform operations with rational expressions. Students will know how to graph rational functions and solve rational equations. Students will be able to use variation models and rational models in real-life situations.

Unit Objectives:

Students will be able to:

1. write and use inverse variation models.
2. graph simple and general rational functions.
3. add, subtract, multiply, and divide rational expressions.
4. simplify complex fractions.
5. solve rational equations
6. use rational models to solve real-life problems.
7. recognize and work with rational functions as translated hyperbolas.

CCCS: 4.3 B 4 C 1 D 1,2; 4.5 F 1 See list at end of guide.

References:

1. Textbook, Chapter 9
2. Practice Workbook with Examples pgs. 175-192
3. Chapter 9 Resource Book
4. Activity 9.2 pg. 546 in text
5. Project pgs. 584-585 in text

Unit 10: Quadratic Relations and Conic sections

Time: 17 days

Unit Goal(s): Students will be able to use the distance and midpoint formulas. Students will classify conics and graph and write equations of conics. Students will be able to solve a system of quadratic equations.

Unit Objectives:

Students will be able to:

1. find the distance between two points in a coordinate plane and the midpoint of a line segment and apply them to real world problems.
2. write the equation of a parabola, graph it and find its focus and directrix and use parabolas to solve real world problems (Internet activity - attached).
3. write and graph the equation of a circle, finding its center and radius and apply it to real world problems.
4. write and graph the equation of an ellipse and apply it to real world problems.
5. write and graph the equation of a hyperbola and apply it to real world problems.
6. recognize conics as cross sections of a double cone and apply to real life problems.
7. solve systems of quadratic equations.

CCCS: 4.2 C 1; 4.3 B 1; 4.5 C 1, 3

References:

1. Textbook, Chapter 10
2. Internet activities (www.exploremath.com) Parabola, Ellipse, Hyperbola - attached at end of Curriculum Guide
3. Practice Workbook with Examples pgs. 193-213
4. Chapter 10 Resource Book

Unit 11: Probability and Statistics

Time: 14 days

Unit Goal(s): Students will be able to count the number of ways an event can happen, calculate and use probabilities, and use binomial and normal distributions.

Unit Objectives:

Students will be able to:

1. use the multiplication counting principle and apply to real world problems.
2. find the number of permutations and combinations of the elements of a set and apply to real world problems.
3. apply the concept of combinations to Pascal's triangle and use Pascal's triangle to solve real world problems.
4. use the binomial theorem to expand a binomial raised to a power.
5. find theoretical, experimental and geometric probabilities.
6. use and find the complement of an event.
7. find probabilities of unions and intersections of two events.
8. find the probability of independent and dependent events.
9. find binomial probabilities and analyze binomial distribution.
10. calculate probabilities using the normal distribution and using the normal distribution to approximate binomial distribution.

CCCS: 4.4 B 1,2,3,4,5,6; C 1,2,3,4; 4.5 F 1 See list at end of guide.

References:

1. Textbook, Chapter 12 and extension on pgs. 753-754.
2. Practice Workbook with Examples pgs. 229-249
3. Chapter 12 Resource Book
4. Activity 12.3 pg. 723 in text