

# Hamburg Area School District Course Guide

| Name:        | Honors Algebra 2  |
|--------------|---|
| Grade(s):    | 9-10  |
| Length:      | Place an X next to the correct option                             |
| x            | Full-Year (182 Sessions)  |
|              | Semester (90 Sessions)  |
|              | Quarter (45 Sessions)   |
|              | Other (Specify):  |
| Text:        | Algebra 2; McDougal Littell; 2007; Larson, Boswell, Kanold, Stiff |
| Approved on: | 2/24/20   |

Description:

This course is designed for those students who plan to proceed through the advanced curriculum in order to take AP Calculus in their senior year. Emphasis is placed on solving difficult one-variable and two-variable equations, critical thinking skills, strengthening and extending mathematical vocabulary, graphing and solving quadratic equations, solving polynomial equations, solving radical equations, solving exponential and logarithmic equations, and simplifying rational expressions.

Unit:FunctionsUnit Length:1.5 weeks

| ESSENTIAL QUESTIONS<br>FOR THE UNIT  | PERFORMANCE OBJECTIVES          | STANDARDS/<br>ANCHORS | SAMPLE FORMATIVE<br>AND SUMMATIVE<br>ASSESSMENTS  |
|--|---------------------------------|-----------------------|---|
| How are functions used to<br>represent/simulate the world  | Graph absolute value functions. | CC.2.2.HS.D.10        | Observation<br>Questioning<br>Discussion  |
| What are some different kinds<br>of functions, and what sorts of<br>real-world situations can they<br>model? | Graph piecewise functions.      | CC.2.2.HS.D.10        | Practice worksheet<br>Graded worksheet<br>IXL: A2.B.1; A2.D.5;<br>A1.DD.2<br>Desmos: Match My Line<br>Desmos: Graphing Stories<br>(This assessment will<br>address EQ 1,2.) |

# Unit: <u>Systems of Linear Equations and Inequalities</u>

Unit Length: <u>5 weeks</u>

| ESSENTIAL QUESTIONS<br>FOR THE UNIT                 | PERFORMANCE OBJECTIVES   | STANDARDS/<br>ANCHORS     | SAMPLE FORMATIVE<br>AND SUMMATIVE<br>ASSESSMENTS  |
|---|--|---------------------------|---|
| What does it mean to solve a system of equations or | Solve a 2x2 system of equations using the elimination method.  | CC.2.2.HS.D.10.A1.1.2.2.1 | Observation<br>Questioning<br>Discussion<br>Practice worksheet<br>IXL: A2.E.8; A2.E.13;<br>A2.G.6; PC.L.10; PC.I.6<br>Desmos: Polygraph:<br>Linear Systems<br>Quiz<br>Review game<br>Unit Project: Investigate<br>properties of determinants<br>using the reduction<br>method<br>Unit test<br>Desmos: Solutions to<br>Systems of Linear<br>Equations (This<br>assessment will address<br>EQ 1.)<br>Unit Project: Google<br>Sheets (create sheets to<br>solve 2x2 and 3x3<br>systems)(This |
| inequalities?<br>Why would using a matrix to        | Solve application problems involving 2x2 systems of equations. | CC.2.2.HS.D.10.A1.1.2.2.1 |   |
| solve a system of equations be useful?              | Solve a 3x3 system of equations using the elimination method.  | CC.2.2.HS.D.10.A1.1.2.2.1 |   |
|   | Solve application problems involving 3x3 systems of equations. | CC.2.2.HS.D.10.A1.1.2.2.1 |   |
|   | Add and subtract matrices.                                     | CC.N-VM.8                 |   |
|   | Multiply matrices by a scalar.                                 | CC.N-VM.7                 |   |
|   | Solve for unknown parts of equivalent matrices.                | CC.N-VM.6                 |   |
|   | Multiply matrices.   | CC.N-VM.8                 |   |
|   | Evaluate 2x2 determinants.                                     | CC.2.2.HS.D.10            | assessment will address<br>EQ 2.)   |
|   | Solve a 2x2 system of equations using Cramer's Rule.           | CC.2.2.HS.D.10            |   |

| Evaluate 3x3 determinants (diagonal method and reduction method). | CC.A-REI.6 |  |
|---|------------|--|
| Solve a 3x3 system of equations using determinants.               | CC.A-REI.6 |  |

Unit: <u>Quadratic Functions</u>

Unit Length: 9 weeks

| ESSENTIAL QUESTIONS<br>FOR THE UNIT                                      | PERFORMANCE OBJECTIVES   | STANDARDS/<br>ANCHORS     | SAMPLE FORMATIVE<br>AND SUMMATIVE<br>ASSESSMENTS                                  |
|--|--|---------------------------|---|
| How are quadratic functions used to represent/simulate the               | Graph parabolas when equation is in standard form.                 | CC.2.2.HS.D.7.A2.2.2.1.1  | Observation<br>Questioning  |
| they so important?   | Graph parabolas when equation is in vertex form.                   | CC.2.2.HS.D.7.A2.2.2.1.1  | Bingo<br>IXL: A2.J.2; A1.BB.2;  |
| How do quadratic functions help us to make the best                      | Solve application problems using the characteristics of parabolas. | CC.2.2.HS.D.7.A2.2.2.1.1  | A2.J.1; A1.AA.2; A2.I.3;<br>A1.AA.1; A2.I.1; A2.L.9;<br>A2.L.11; A1.EE.7; A2.H.4; |
| decision?<br>Why do we factor  | Convert quadratic equations from vertex form to standard form.     | CC.2.2.HS.D.5.A2.1.3.1.1  | A2.H.6; A2.J.10; A2.J.7;<br>A2.K.2<br>Desmos: Will It Hit the                     |
| polynomials?   | Convert quadratic equations from intercept form to standard form.  | CC.2.2.HS.D.5.A2.1.3.1.1  | Hoop?<br>Desmos: Polygraph:<br>Parabolas  |
| efficient method for solving a   |  |                           | QUIZ<br>Application problems  |
| quadratic equation?  | Factor the GCF out of a polynomial expression.                     | CC.2.2.HS.D.5.A2.1.2.2.1  | (These problems will<br>address EQ 3,4,7.)  |
| How can functions be   |  |                           | Practice Test   |
| How do transformations affect the parent function?                       | Factor a polynomial in the form x <sup>2</sup> +bx+c.              | CC.2.2.HS.D.2.A2.1.2.2.1  | Google Sheet<br>Unit project: Derive the<br>Quadratic Formula                     |
| In what situations is zero or a negative number an inappropriate answer? | Factor a polynomial in the form ax <sup>2</sup> +bx+c.             | CC.2.2.HS.D.5.A2.1.2.2.1  | Unit test (Students will<br>complete problems that<br>address EQ 5,6. Students    |
|  | Solve x <sup>2</sup> +bx+c=0 by factoring.                         | CC.2.2.HS.D.10.A2.1.3.1.1 | will complete application<br>problems that address EQ<br>1,2.)                    |

| Solve x <sup>2</sup> +bx=0 by factoring.  | CC.2.2.HS.D.10.A2.1.3.1.1 |  |
|---|---------------------------|--|
| Solve ax <sup>2</sup> +bx+c=0 by factoring.   | CC.2.2.HS.D.10.A2.1.3.1.1 |  |
| Simplify radical expressions with and without variables.                                  | CC.2.1.HS.D.2.A2.1.2.1.2  |  |
| Add and subtract radical expressions.   | CC.2.1.HS.D.2.A2.1.2.1.2  |  |
| Multiply radical expressions with and without variables.                                  | CC.2.1.HS.D.2.A2.1.2.1.2  |  |
| Divide radical expressions (rationalizing with denominator and conjugate of denominator). | CC.2.1.HS.D.2.A2.1.2.1.2  |  |
| Solve ax <sup>2</sup> +c=0 by taking square roots (real answers).                         | CC.2.2.HS.D.10.A2.1.3.1.1 |  |
| Simplify radical expressions involving imaginary numbers.                                 | CC.2.1.HS.F.6.A2.1.1.1.1  |  |
| Simplify higher powers of imaginary numbers.  | CC.2.1.HS.F.6.A2.1.1.1.2  |  |
| Add and subtract expressions involving complex numbers.                                   | CC.2.1.HS.F.6.A2.1.1.2.1  |  |
| Multiply expressions involving complex numbers.   | CC.2.1.HS.F.6.A2.1.1.2.2  |  |
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| Divide expressions involving complex<br>numbers (rationalizing with a pure imaginary<br>number and conjugate of denominator). | CC.2.1.HS.F.6.A2.1.1.2.2  |  |
|---|---------------------------|--|
| Solve ax <sup>2</sup> +c=0 by taking square roots (complex answers).  | CC.2.2.HS.D.10.A2.1.3.1.1 |  |
| Solve ax <sup>2</sup> +bx+c=0 by completing the square.   | CC.2.2.HS.D.10.A2.1.3.1.1 |  |
| Solve ax <sup>2</sup> +bx+c=0 by using the quadratic formula.   | CC.2.2.HS.D.10.A2.1.3.1.1 |  |
| Solve application problems by solving various types of quadratic equations.   | CC.2.2.HS.D.10.A2.1.3.1.1 |  |

Unit: <u>Polynomial Functions</u>

Unit Length: 4.5 weeks

| ESSENTIAL QUESTIONS<br>FOR THE UNIT  | PERFORMANCE OBJECTIVES   | STANDARDS/<br>ANCHORS     | SAMPLE FORMATIVE<br>AND SUMMATIVE<br>ASSESSMENTS  |
|--|--|---------------------------|---|
| How are polynomial functions<br>used to represent/simulate the                             | Predict end behavior and sketch the graph of a polynomial function.  | CC.2.4.HS.B.2.A2.2.1.1.4  | Observation<br>Questioning<br>Discussion  |
| they so important?   | Evaluate polynomial functions.   | CC.2.2.HS.D.7.A2.2.2.1.1  | Practice worksheet<br>IXL: A2.K.2; A2.I.7;  |
| How do polynomial functions  | Graph polynomial functions.  | CC.2.2.HS.D.7.A2.2.2.1.1  | A2.K.5; A2.K.1; A2.M.1<br>IXL: A2.K.14 (This  |
| decision?  | Add and subtract polynomial expressions.   | CC.2.2.HS.D.2.A2.1.2.1.3  | assessment will address<br>EQ 5.)<br>Desmos: Expressions  |
| Why do we factor polynomials?  | Multiply polynomial expressions.   | CC.2.2.HS.D.2.A2.1.2.1.3  | Mash Up (This<br>assessment will address<br>EQ 4.)<br>Quiz (Students will<br>complete application<br>problems that address EQ<br>1,2.)<br>Review game<br>Unit test (Students will<br>complete problems that<br>address EQ 3,6.) |
| How can functions be   | Square a binomial using the formula shortcut.  | CC.2.2.HS.D.2.A2.1.2.1.3  |   |
| How do transformations affect  | Cube a binomial using the formula shortcut.  | CC.2.2.HS.D.2.A2.1.2.1.3  |   |
| How do we find the solutions<br>to a polynomial function<br>algebraically and graphically? | Factor and solve polynomial equations in the form: difference of two squares, perfect square trinomials, beyond a GCF, quadratic form, grouping. | CC.2.2.HS.D.5.A2.1.2.2.1  |   |
|  | Use the Quadratic Formula to solve a polynomial equation after the GCF is factored.  | CC.2.2.HS.D.10.A2.1.3.1.1 |   |
|  | Divide polynomials using long division.  | CC.2.2.HS.C.3.A2.2.2.1.1  |   |

| Divide polynomials using synthetic division.                                       | CC.2.2.HS.C.3.A2.2.2.1.1 |  |
|--|--------------------------|--|
| Factor higher degree polynomial expressions, given one factor.                     | CC.2.2.HS.D.5.A2.1.2.2.1 |  |
| Factor and solve higher degree polynomial equations, given one factor or solution. | CC.2.2.HS.D.5.A2.1.2.2.1 |  |

Unit: <u>Radical Functions</u>

Unit Length: 6.5 weeks

| ESSENTIAL QUESTIONS FOR<br>THE UNIT                            | PERFORMANCE OBJECTIVES   | STANDARDS/<br>ANCHORS     | SAMPLE FORMATIVE<br>AND SUMMATIVE<br>ASSESSMENTS   |
|--|--|---------------------------|--|
| How are radical functions used to represent/simulate the world | Convert rational exponent form to radical form; and vice versa.            | CC.2.2.HS.D.2.A2.1.2.1.3  | Observation<br>Questioning   |
| we live in, and why are they so important?                     | Evaluate expressions with rational exponents.                              | CC.2.2.HS.D.2.A2.1.2.1.3  | discuss EQ3 during<br>instruction.)  |
| How do radical functions help us to make the best decision?    | Simplify expressions with rational exponents.                              | CC.2.2.HS.D.2.A2.1.2.1.3  | Practice worksheet<br>Application problems<br>(Students will complete  |
| Why is the idea of "inverse" so                                | Use a calculator to evaluate expressions with rational exponents.          | CC.2.2.HS.D.2.A2.1.2.1.3  | application problems that<br>address EQ 1,2.)<br>Graded worksheet  |
| How can we make sense of                                       | Solve ax <sup>n</sup> =c by taking the n <sup>th</sup> root.               | CC.2.2.HS.D.10.A2.1.3.1.1 | IXL: A1.V.10; A2.M.5;<br>A2.M.6; A2.O.1; A2.O.2;<br>A2.O.4; A2.O.5; A2.O.6;<br>A2.L.12; A2.L.13; A2.Q.4<br>Desmos: Polygraph:<br>Square Root Functions |
| exponents that are not<br>integers?                            | Simplify radical expressions beyond square root.                           | CC.2.1.HS.D.2.A2.1.2.1.2  |  |
| the parent function?   |  |                           | will complete problems   |
| In what situations is a solution an inappropriate answer?      | Add, subtract, multiply and divide radical expressions beyond square root. | CC.2.1.HS.D.2.A2.1.2.1.2  | that address EQ 4.)<br>Review game<br>Unit test (Students will<br>complete problems that   |
|  | Add, subtract, multiply and divide all types of functions.                 | CC.2.1.HS.D.2.A2.1.2.1.2  | address EQ 5,6.)   |
|  | Perform function composition in the form: f(g(7)).                         | CC.2.2.HS.C.3.A2.2.2.1.1  |  |

| Perform function composition in the form: f(g(2x+1)).            | CC.2.2.HS.C.3.A2.2.2.1.1  |  |
|--|---------------------------|--|
| Perform function composition in the form: f(g(x)).               | CC.2.2.HS.C.3.A2.2.2.1.1  |  |
| Solve for the inverse of a function.                             | CC.2.2.HS.C.4.A2.1.3.2.2  |  |
| Graph a function and its inverse.                                | CC.2.2.HS.C.4.A2.1.3.2.2  |  |
| Prove whether or not two functions are inverses.                 | CC.2.2.HS.C.4.A2.1.3.2.2  |  |
| Graph square root functions.                                     | CC.2.2.HS.D.7.A2.2.2.1.1  |  |
| Graph cube root functions.                                       | CC.2.2.HS.D.7.A2.2.2.1.1  |  |
| Solve a radical equation where one side is a constant.           | CC.2.2.HS.D.10.A2.1.3.1.2 |  |
| Solve a radical equation that contains a radical on each side.   | CC.2.2.HS.D.10.A2.1.3.1.2 |  |
| Solve a radical equation with a variable expression on one side. | CC.2.2.HS.D.10.A2.1.3.1.2 |  |
|  |                           |  |

| Solve a radical equation with a radical and constant on one side. | CC.2.2.HS.D.10.A2.1.3.1.2 |  |
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# Unit: <u>Exponential and Logarithmic Functions (last unit if time permits)</u>

Unit Length: <u>3.5 weeks</u>

| ESSENTIAL QUESTIONS<br>FOR THE UNIT   | PERFORMANCE OBJECTIVES  | STANDARDS/<br>ANCHORS     | SAMPLE FORMATIVE<br>AND SUMMATIVE<br>ASSESSMENTS   |
|---|---|---------------------------|--|
| How are exponential and<br>logarithmic functions used to<br>represent/simulate the world<br>we live in, and why are they so<br>important?<br>How do exponential and<br>logarithmic functions help us to<br>make the best decision?<br>How do transformations affect<br>the parent function?<br>What is a logarithm? | Graph exponential growth functions.                                     | CC.2.2.HS.D.7.A2.2.2.1.2  | Observation<br>Questioning<br>Discussion<br>Practice worksheet<br>IXL: 8.K.11; A2.S.14;<br>A2.R.6<br>IXL: A2.R.1 (This<br>assessment will address<br>EQ 4.)<br>Desmos: Polygraph:<br>Exponentials<br>Desmos: What Comes<br>Next?<br>Desmos: Marbleslides:<br>Exponentials (This<br>assessment will address<br>EQ 3.)<br>Quiz (Students will<br>complete application<br>problems that address EQ<br>1,2.) |
|   | Solve application problems involving exponential growth.                | CC.2.2.HS.D.10.A2.1.3.1.4 |  |
|   | Solve application problems involving compound interest.                 | CC.2.2.HS.D.10.A2.1.3.1.4 |  |
|   | Graph exponential decay functions.                                      | CC.2.2.HS.D.7.A2.2.2.1.2  |  |
|   | Solve application problems involving exponential decay.                 | CC.2.2.HS.D.10.A2.1.3.1.4 |  |
|   | Evaluate expressions involving the natural base.                        | CC.2.2.HS.D.7.A2.2.2.1.2  |  |
|   | Graph natural base functions.   | CC.2.2.HS.D.7.A2.2.2.1.2  |  |
|   | Solve application problems involving continuously compounding interest. | CC.2.2.HS.D.10.A2.1.3.1.4 |  |
|   | Evaluate logarithms.  | CC.2.2.HS.D.2.A2.1.2.1.3  |  |
|   | Apply properties of logarithms.   | CC.2.2.HS.D.2.A2.1.2.1.3  |  |

| Graph logarithmic functions. | CC.2.2.HS.D.7.A2.2.2.1.2 |  |
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Unit: <u>Rational Functions</u>

Unit Length: 5.5 weeks

| ESSENTIAL QUESTIONS<br>FOR THE UNIT  | PERFORMANCE OBJECTIVES  | STANDARDS/<br>ANCHORS     | SAMPLE FORMATIVE<br>AND SUMMATIVE<br>ASSESSMENTS   |
|--|---|---------------------------|--|
| How are rational functions<br>used to represent/simulate the<br>world we live in, and why are<br>they so important?<br>How do rational functions help<br>us to make the best decision?<br>How is it possible to keep<br>getting closer and closer to<br>something, but never actually<br>touch it? | Identify and write direct, inverse, joint and combined variation equations. | CC.2.2.HS.C.3.A2.1.3.2.1  | Observation<br>Questioning<br>Discussion<br>Practice worksheet<br>(Students will complete<br>application problems that<br>address EQ 1,2.)<br>Graded worksheet<br>IXL: A2.Q.5<br>IXL: A2.N.4 (This<br>assessment will address<br>EQ 4)<br>Desmos: Polygraph:<br>Rational Functions<br>Rational Functions<br>Scavenger Hunt<br>8.1 / 8.2 Quiz (Students<br>will complete problems<br>that address EQ 3,5.)<br>Unit test |
|  | Graph rational functions.   | CC.2.2.HS.D.7.A2.2.2.1.1  |  |
|  | Factor and simplify rational expressions.                                   | CC.2.2.HS.D.2.A2.1.2.2.2  |  |
|  | Multiply rational expressions.  | CC.2.2.HS.D.2.A2.1.2.2.2  |  |
|  | Divide rational expressions.  | CC.2.2.HS.D.2.A2.1.2.2.2  |  |
| How can functions be represented in multiple ways?   | Add and subtract rational expressions with like denominators.               | CC.2.2.HS.D.2.A2.1.2.2.2  |  |
| How do transformations affect the parent function?   | Add and subtract rational expressions with unlike denominators.             | CC.2.2.HS.D.2.A2.1.2.2.2  |  |
|  | Solve basic rational equations.   | CC.2.2.HS.D.10.A2.1.3.1.2 |  |
|  | Solve more complicated rational equations.                                  | CC.2.2.HS.D.10.A2.1.3.1.2 |  |