The Facing History School

Algebra 2/Trig 2017-2018

Semester 1

Period: 7

Teacher: Colleen

Course Overview:

Algebra 2/Trigonometry is designed to engage and challenge students as they use logic and reason to explore and model with functions in multiple contexts. Students will use technology to support them in analyzing and modeling situations with functions.. The course has been developed to allow for student exploration, practice, and application of topics as they move through multiple levels of performance. Students will complete a panel or PBAT project, depending on grade level, in January.

Unit 1: Linear Functions

September

Essential Question(s):

What are the characteristics of some of the basic parent functions?
How do the graphs of $y = f(x) + k$, $y = f(x - h)$, and $y = -f(x)$ compare to the graph of the parent function f ?

Unit Learning Targets:

I can evaluate expressions.
I can transform figures on the coordinate plane.
I can explore parent functions using a graphing calculator.
I can identify basic parent functions.
I can describe transformations of parent functions.
I can describe combinations of transformations.
I can write linear and absolute value functions representing translations and reflections.
I can write linear and absolute value functions representing stretches and shrinks.
I can write linear and absolute value functions representing combinations of transformations.

Assignments:

Learning Activities: Do Now, Notebook checks, Independent/Group activities, homework
Formative: Exit Tickets (multiple times per week), Interim Assessments
Summative: Summative Exam (9/27)

Common Core Standards:

CCSS.MATH.CONTENT.HSF.BF.B.3
Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

CCSS.MATH.CONTENT.HSF.IF.C.9
Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum*.

CCSS.MATH.CONTENT.HSF.LE.A.2
Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

CCSS.MATH.CONTENT.HSF.BF.A.1
Write a function that describes a relationship between two quantities.*

CCSS.MATH.CONTENT.HSA.CED.A.2
Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

Unit 2: Line of Best Fit & Linear Systems

September-October

Essential Question(s):

How can you use a linear function to model and analyze a real-life situation?

How can you determine the number of solutions of a linear system?

Unit Learning Targets:

I can determine the slope of a line given two points on the line.
I can write the equation of a line using the slope and a point on the line.
I can find lines of best fit using a graphing calculator.
I can use a line of best fit to model data and make predictions.
I can write and systems of equations in two variables to represent situations.
I can solve a system of equations in two variables by graphing.
I can solve a system of equations in two variables by elimination.
I can solve a system of equations in two variables by substitution.

Assignments:
Learning Activities: Do Now, Notebook checks, Independent/Group activities, homework
Formative: Exit Tickets (multiple times per week), Interim Assessments
Summative: Summative Exam (10/13)

Common Core Standards:

CCSS.MATH.CONTENT.HSF.LE.A.2
Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

CCSS.MATH.CONTENT.HSF.BF.A.1
Write a function that describes a relationship between two quantities.*

CCSS.MATH.CONTENT.HSA.CED.A.2
Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

CCSS.MATH.CONTENT.HSS.ID.B.6.A
Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

CCSS.MATH.CONTENT.HSA.CED.A.3
Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods*.

CCSS.MATH.CONTENT.HSA.REI.C.6
Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

Unit 3: Rational Expressions & Equations

October

Essential Question(s):

How can you recognize when two quantities vary directly or inversely?
What are some of the characteristics of the graph of a rational function?

How can you determine the excluded values in a product or quotient of two rational expressions?
How can you determine the domain of the sum or difference of two rational expressions?
How can you solve a rational equation?

Unit Learning Targets:

I can classify direct and inverse variation.
I can write inverse variation equations.
I can graph simple rational functions.
I can translate simple rational functions.
I can simplify rational expressions.
I can multiply rational expressions.
I can divide rational expressions.
I can ad or subtract rational expressions.
I can rewrite rational expressions.
I can simplify complex fractions.
I can solve rational equations by cross-multiplying.
I can solve rational equations by using the least common denominator.
I can use inverses of functions.

Assignments:

Learning Activities: Do Now, Notebook checks, Independent/Group activities, homework
Formative: Exit Tickets (multiple times per week), Interim Assessments
Summative: Summative Exam (11/1)

Common Core Standards:

CCSS.MATH.CONTENT.HSA.CED.A.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*.

CCSS.MATH.CONTENT.HSA.CED.A.2
Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

CCSS.MATH.CONTENT.HSA.CED.A.3
Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling

context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods*.

CCSS.MATH.CONTENT.HSA.CED.A.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*.

CCSS.MATH.CONTENT.HSA.APR.D.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.

CCSS.MATH.CONTENT.HSA.APR.D.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.

CCSS.MATH.CONTENT.HSA.REI.A.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.

CCSS.MATH.CONTENT.HSA.REI.A.2
Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

CCSS.MATH.CONTENT.HSF.BF.B.3
Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

Unit 3: Quadratic Functions & Equations

November

Essential Question(s):

How do the constants a, h, and k affect the graph of the quadratic function $g(x) = a(x - h)^2 + k$?
What type of symmetry does the graph of $f(x) = a(x - h)^2 + k$ have and how can you describe this symmetry?

What is the focus of a parabola?
How can you use a quadratic function to model a real-life situation?

Unit Learning Targets:

I can describe transformations of quadratic functions.
I can write transformations of quadratic functions.
I can describe properties of parabolas.
I can find maximum and minimum values of quadratic functions.
I can find the x intercepts of a quadratic function.
I can graph quadratic functions using x-intercepts.
I can describe the focus and directrix of a quadratic function.
I can write equations of quadratic functions using vertices, x-intercepts, and points.
I can model situations as quadratic functions.

Assignments:

Learning Activities: Do Now, Exit Ticket, Notes, Independent/Group activities
Formative: Exit Tickets (multiple times per week), Interim Assessments
Summative: Summative Exam (11/29)

Common Core Standards:

CCSS.MATH.CONTENT.HSA.CED.A.2
Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

CCSS.MATH.CONTENT.HSA.APR.B.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 $p(x)$.

CCSS.MATH.CONTENT.HSF.BF.B.4
Find inverse functions.

CCSS.MATH.CONTENT.HSF.IF.B.6
Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.*

CCSS.MATH.CONTENT.HSF.IF.C.7.A
Graph linear and quadratic functions and show intercepts, maxima, and minima.

CCSS.MATH.CONTENT.HSF.IF.C.9
Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For*

example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.

CCSS.MATH.CONTENT.HSF.BF.A.1
Write a function that describes a relationship between two quantities.*

CCSS.MATH.CONTENT.HSF.BF.B.3
Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

CCSS.MATH.CONTENT.HSG.GPE.A.2
Derive the equation of a parabola given a focus and directrix.

CCSS.MATH.CONTENT.HSS.ID.B.6.A
Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

Unit 4: Quadratic Equations & Complex Numbers

November - December

Essential Questions:

How can you use the graph of a quadratic equation to determine the number of real solutions of the equation?
What are the subsets of the set of complex numbers?
How can you complete the square for a quadratic expression?
How can you derive a general formula for solving a quadratic equation?
How can you solve a nonlinear system of equations?

Unit Learning Targets:

I can solve quadratic equations by graphing.
I can solve quadratic equations algebraically.
I can define and use the imaginary unit *i*.
I can add, subtract, and multiply complex numbers.
I can find complex solutions and zeros.
I can solve quadratic equations using square roots.
I can solve quadratic equations by completing the square.
I can write quadratic functions in vertex form.
I can solve quadratic equations using the Quadratic Formula.

I can analyze the discriminant to determine the number and type of solutions.
I can model real world situations as quadratic functions.
I can solve systems of nonlinear equations.
I can graph quadratic inequalities in two variables.
I can solve quadratic inequalities in one variable.

Major Assignments:

Formative: Exit Tickets (multiple times per week), Interim Assessments

Summative: Summative Exam (Panel/PBAT – checkpoint grades: 12/15, 12/29, 1/12)

Common Core Standards:

CCSS.MATH.CONTENT.HSN.CN.A.1
Know there is a complex number *i* such that *i*2 = -1, and every complex number has the form *a + bi* with *a* and *b* real.

CCSS.MATH.CONTENT.HSN.CN.A.2
Use the relation *i*2 = -1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.

CCSS.MATH.CONTENT.HSN.CN.C.7
Solve quadratic equations with real coefficients that have complex solutions.

CCSS.MATH.CONTENT.HSA.CED.A.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*.

CCSS.MATH.CONTENT.HSA.CED.A.3
Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods*.

CCSS.MATH.CONTENT.HSA.SSE.A.2
Use the structure of an expression to identify ways to rewrite it. *For example, see x4 - y4 as (x2)2 - (y2)2, thus recognizing it as a difference of squares that can be factored as (x2 - y2)(x2 + y2)*.

CCSS.MATH.CONTENT.HSA.REI.B.4.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* ± *bi* for real numbers *a* and *b*.

CCSS.MATH.CONTENT.HSA.REI.C.7
Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y = -3x$ and the circle $x2 + y2 = 3$.

CCSS.MATH.CONTENT.HSA.REI.D.11
Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*

CCSS.MATH.CONTENT.HSF.IF.C.8.A
Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.

Unit 6: Polynomials & Polynomial Functions

December - January

Essential Questions:

What are some common characteristics of the graphs of cubic and quartic polynomial functions?
How can you determine whether a polynomial equation has a repeated solution?
How can you determine whether a polynomial has imaginary solutions?
How can you transform the graph of a polynomial function?
How many turning points can the graph of a polynomial function have?
How can you find a polynomial model for real-life data?

Unit Learning Targets:

I can identify polynomial functions.
I can graph polynomial functions using tables and end behavior.
I can ad and subtract polynomials.
I can multiply polynomials.
I can use Pascal's Triangle to expand binomials.
I can use long division to divide polynomials by other polynomials.
I can use synthetic division to divide polynomials by binomials of the form x-k.
I can factor polynomials.
I can find solutions of polynomial equations and zeros of polynomial functions.
I can find conjugate pairs of complex zeros of polynomial functions. I can describe transformations of polynomial functions.

I can write transformations of polynomial functions.
I can find turning points and identify local maximums and local minimum of graphs of polynomial functions.
I can identify even and odd functions.
I can write polynomial functions for sets of points.

Major Assignments:

Learning Activities: Do Now, Notebook checks, Independent/Group activities, homework

Formative: Exit Tickets (multiple times per week), Interim Assessments

Summative: Summative Exam (2/14 – semester two grade)

Common Core Standards:

CCSS.MATH.CONTENT.HSN.CN.C.8
(+) Extend polynomial identities to the complex numbers. *For example, rewrite* $x^2 + 4$ *as* $(x + 2i)(x - 2i)$.

CCSS.MATH.CONTENT.HSN.CN.C.9
(+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

CCSS.MATH.CONTENT.HSA.SSE.A.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* $(x^2 - y^2)(x^2 + y^2)$.

CCSS.MATH.CONTENT.HSA.APR.A.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.

CCSS.MATH.CONTENT.HSA.APR.B.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 $p(x)$.

CCSS.MATH.CONTENT.HSA.APR.B.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.

CCSS.MATH.CONTENT.HSA.APR.C.4
Prove polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity* $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ *can be used to generate Pythagorean triples.*

CCSS.MATH.CONTENT.HSA.APR.C.5
(+) Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.[1]

CCSS.MATH.CONTENT.HSA.APR.D.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.

CCSS.MATH.CONTENT.HSA.CED.A.2
Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

CCSS.MATH.CONTENT.HSF.IF.B.4
For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity*.*

CCSS.MATH.CONTENT.HSF.IF.C.7.C
Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

CCSS.MATH.CONTENT.HSF.BF.A.1.A
Determine an explicit expression, a recursive process, or steps for calculation from a context.

CCSS.MATH.CONTENT.HSF.BF.B.3
Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

Classroom Rules

What to do...	What NOT to do...
● Arrive early or on time	● Speak when someone else is speaking ● Wear headphones without permission

● Come prepared with required materials (notebook, pencil, folder) ● Stay on task ● Use respectful language when responding to or questioning your peers and teacher ● Respect your space by cleaning up after yourself ● Let the teacher know if you're having a bad day	● Use your cell phone ● Come to class late without a pass ● Leave the room without permission ● Be out of uniform ● Use inappropriate language ● Disregard or insult the ideas of your peers

<u>If you break a classroom rule, here is the order of what will happen:</u>

1.) *<u>Redirect</u>*
2.) *<u>Verbal Warning</u>* or *<u>Request an action</u>*
3.) *<u>One-on-one conversation</u>* (either quietly in the classroom or out in the hallway)
4.) *<u>Call home and/or sent to Courtney or admin office.</u>*

Classroom behavior also impacts participation scores. Positive behavior will result in increased participation scores and inappropriate behavior will result in decreased participation scores. *Keep in mind that even after a one-on-one conversation, **you are in control** of whether you improve the daily score or allow it to be impacted by the mistake.*

<u>Cell Phones</u>

Schoolwide Policy: Cell phones are allowed in the school building but must be locked in your lockers. If you have your cell phone out during class, **depending on how you respond and react depends on what will happen with your cell phone. I will ask you to put it away one time. After that:**

<u>I will either keep it until:</u>

a.) The end of the class period then give it back to you before you leave
b.) The end of the day then give it back to you when you come get it from one of us at the end of the day
c.) Turn the cell phone into the admin office/dean office.
If kept with us, your cell phone will be securely locked in a closet to ensure its safety.

<u>Uniform</u>

You are expected to follow the school uniform policy in this class. If your shirt or pants are out of uniform (including hoodies), you will be sent to the admin offices to receive an appropriate uniform.

<u>Headphones</u>

Headphones **should not be visible** on your body. Headphones are ***not allowed*** in your ears, draped around your ears, and all the other possible ways to wear headphones. Sometimes you'll be allowed to listen to music when you work, but you will be given permission to do so.

If you are wearing headphones without permission:
1. You will be asked to put them away
2. You will submit them until the end of the class period
3. You will submit them until the end of the day
4. You will have to pick up your headphones from administration or Courtney

Bathroom/Water Fountain Policy
School-wide Policy: No students can use the bathroom during the first 10 minutes of class or last 10 minutes of class.

One person is allowed to leave the room at a time. After asking Colleen for permission to leave the room, take the bathroom pass with you. No students should ever leave the room without permission AND a pass.

Late to class
If you come to class late, have a pass. It is your responsibility to ask the adult for a pass. If you do not have a pass, you will be marked as an unexcused tardy. **Lateness will be logged and 3 unexcused lateness = call home.**

If you leave the classroom during class time without permission, you need to get a pass to re-enter without consequence. Leaving the room without permission will result in participation score deduction OR outreach to administration or your guardian, depending on the situation.

Absent to Class
Planned Absence = you know you are going to be absent (e.g. doctor's appointment)
Make sure you let me know so I can give you the missing work.

Unplanned Absence = you are absent but did not anticipate or expect it (e.g. illness)
Let me know so I can create a plan to help you make up the work you missed.

Regardless if your absence is planned or unplanned, **IT IS YOUR RESPONSIBILITY to come receive the work you missed that day in order to catch up.** Additionally, if you want one-on-one tutoring, teaching, etc. due to an absence, please set up an appointment with Colleen for before school, during lunch, or after school.
Makeup Work
If your absence is excused, you will be able to make up work with no penalty.

Late work without an eligible excuse:
- You may makeup work until we move onto the next unit
- Complete a late work slip to submit with your late work

- Your work will be deducted 20% for lateness

Grading Policy:

Teacher grade books must be updated each week on Tuesdays. I will probably do it more than that but, at minimum, the grade book is updated once a week.

The grade book is divided into three sections:

- **Learning Activities (do now, daily activity, etc.)**

3-5 grade learning activities will be entered each week = roughly 60 to 80 grades per semester

- **Formative Assessments (quizzes, performance tasks)**

2-4 per unit = roughly 10 per semester

- **Summative Assessments (unit exams, major projects)**

1-2 per unit = roughly 6 per semester

- ***Panel/PBAT:*** *You will complete your math Panel or math PBAT (depending on your graduation year) in this class. We will begin this work in December and you will present in January. Completion of this major assessment is necessary to remain on track to graduate when expected. Checkpoints will be graded as a summative assessment for this course and your final presentation score (pass or fail) will be on your official transcript.*

Grading Scale:

A+	97-100	B+	87-89	C+	77-79
A	93-96	B	83-86	C	73-76
A-	90-92	B-	80-82	C-	65-73
				F	0-64

Plagiarism (copying) & Cheating

- Copying another student's work is plagiarism.
- Cheating on an assignment, quiz, test, etc. is not tolerated.

All of these acts are forbidden and consequences will be issued on a case-to-case basis by myself, and the admin team (Dana, Kristina, and/or Calee). Your parent and guardian will be notified as well.

Materials for Class

- Notebook

- Folder
- Pencils
- Calculator

Office Hours

T**hursdays from 3pm-4pm** or **by appointment**.

By appointment means that we agree upon a time to meet and then you come see me at that time to meet.

Teacher Contact Information

Colleen Burge
Cell Phone: (215)-350-7187
Feel free to text or call; however, please do not text or call after 8pm. Thanks!
Email: colleen@facinghistoryschool.org