# Course Syllabus

| Franklin High School | 2020-2021 |
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DIRECTIONS: For each course, complete the syllabus and share with your evaluating/supervising administrator **as a pdf** ("File-download-PDF document") by 9/28/20. Syllabi will be posted on the FHS website under your name for the public to view.

## Course Overview

NOTE: For core classes, all elements of this section (except for name and contact information) are the same.

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| Course Title: Precalculus | |
| Instructor Name:Kevin Denney | Contact Info:kdenney@pps.net |
| Grade Level(s):9-12 | |
| Credit Type: (i.e. "science", "elective")Math elective | # of credits per semester:1 |
| Prerequisites (if applicable): passed advanced algebra 34 | |

General Course Description:This course is a fourth year math class and considered an upper level math class. Students should have passed Algebra, Geometry, and Advanced Algebra. The class will cover similar topics to Advanced Algebra but will go deeper and add more difficult concepts. The students will be tested on each chapter and a cumulative final at the end of each semester.

Prioritized National/State Standards:

**Standards:**

**Based on PCC's Course Content and Outcome Guides Semester 1:**

1. Explore and analyze functions represented in a variety of forms (numerically, symbolically, verbally and graphically).

    1. Given a function in any form, identify and express understanding of the domain and range, the horizontal intercept(s), the vertical intercept, the asymptotes as appropriate, and the end behavior.
    2. Given a function represented graphically, identify and express an understanding of the local and absolute extrema and the approximate intervals over which the function is increasing or decreasing and concave up or concave down as appropriate.
    3. Construct and express understanding of new functions from functions represented in any form.
        1. Construct and express understanding of a sum, difference, product or quotient of two given functions.
        2. Construct and express understanding of a composition of two given functions.
        3. Construct and express understanding of the inverse of a given function.

    4. Investigate and express understanding of the new functions in context of applications.
4. Investigate families of functions in any form within the context of transformations.
    1. Shift, reflect and/or stretch a given function horizontally or vertically.
    2. Investigate and express understanding of given transformations in context of applications.
    3. Investigate and express understanding of the symmetry of even and odd functions.

2. Explore and analyze exponential functions represented in a variety of forms

(numerically, symbolically, verbally and graphically) in context of applications.

1. Given an exponential function that is represented graphically, numerically or symbolically, express it in the other two forms.
2. Write the symbolic form of exponential functions represented in various forms.
    1. Given two points from an exponential function, generate a model symbolically.
    2. Given initial value and growth rate, generate a model symbolically.
    3. Given a table of values, determine if the model is linear or exponential and generate an appropriate model symbolically.
    4. Given the graph of the function, generate a model symbolically.
3. Solve exponential equations symbolically, distinguishing between exact and approximate solutions.
4. Investigate different forms of exponential functions
5. Solve a variety of applied problems involving exponential functions (such as radioactive decay, bacteria growth, population growth, and compound interest). All variables in applications shall be appropriately defined with units.
6. Explore and analyze logarithmic functions represented in a variety of forms (numerically, symbolically, verbally and graphically) in context of applications.
    1. Express logarithmic functions, using a variety of bases in addition to $e$e and 10, as inverse functions of exponential functions represented in various forms.
    2. Given a logarithmic function that is represented graphically, numerically or symbolically, the student should be able to express it in the other two forms.
    3. Using properties of logarithms, including change of base, simplify logarithmic expressions and solve logarithmic equations graphically and symbolically, distinguishing between exact and approximate solutions.
    4. Solve a variety of applied problems involving logarithmic functions (such as intensity of sound, earthquake intensity, and determining acidity of a solution by its pH). All variables in applications shall be appropriately defined with units.

7. Explore and analyze polynomial functions represented in a variety of forms (numerically, symbolically, verbally and graphically) in context of applications.
    1. Investigate the end-behavior of power functions.
    2. Given a polynomial function that is represented graphically, represent it symbolically
    3. Given a polynomial function in factored form, graph it by hand.
    4. Distinguish the relationship between zeros, roots, solutions and the horizontal-intercepts of a polynomial function.
    5. Find and estimate zeros of a polynomial that is represented in a variety of forms.

1. Distinguish between exact and approximate solutions, including

complex solutions.

6. Sketch a polynomial function given the roots of the function, and the corresponding multiplicity of each root.
7. Solve a variety of applied problems involving polynomial functions. All variables in applications shall be appropriately defined with units.

5. Explore and analyze rational functions represented in a variety of forms

(numerically, symbolically, verbally and graphically) in context of applications.

1. Given a rational function that is represented graphically, represent it symbolically.
2. Given a rational function in factored form, graph it by hand.
3. Find horizontal asymptotes, vertical asymptotes, and holes of rational functions.
4. Recognize oblique asymptotes graphically.
5. Understand the concept of limits in the context of asymptotes.
6. Solve a variety of applied problems involving rational functions. All variables

in applications shall be appropriately defined with units.

1. Develop an understanding of angles in different systems of measure.

1. Understand the definition of an angle in standard position and identify the initial and terminal rays.
2. Express the measure of an angle in degrees, degrees-minutes-seconds (DMS), and radians.

1. Convert between the angle-measures listed.

3. Sketch an angle of any given measure in standard position and identify the related or reference angle and coterminal angles.

4. Find the length of an arc on the circumference of a circle using the definition of an angle in radian measure.

2. Explore and analyze periodic functions.

1. Determine
2. Determine
3. Determine applicable.
4. Define the
5. Determine functions.
6. Define the determine
7. Define the

if a function is periodic.

the period of a periodic function.

the amplitude and midline of a periodic function where

sine and cosine functions in terms of the unit circle.

the period, midline, and amplitude of the sine and cosine

tangent function in terms of the sine and cosine functions and its period.

reciprocal trigonometric functions.

3. Develop an understanding of right triangle trigonometry using both radians and degrees.
    1. Define the six trigonometric functions of an acute angle in terms of the sides of a right triangle.
    2. Solve right triangles:
        1. Given two sides.
        2. A side and a non-right angle of the triangle.
    3. Evaluate the exact values of the six trigonometric functions using $30^\circ - 60^\circ - 90^\circ 30^\circ - 60^\circ - 90^\circ$ and $45^\circ - 45^\circ - 90^\circ 45^\circ - 45^\circ - 90^\circ$ triangles.
    4. Solve applied problems involving right triangles.
4. Explore and analyze transformations of trigonometric functions.
    1. Investigate trigonometric functions within the context of transformations represented graphically, symbolically, numerically and verbally.
5. Shift, reflect and stretch a given trigonometric function horizontally and vertically.

        1. Given graphs of sinusoidal functions, identify the phase shift, horizontal shift, amplitude, period and midline and write an equation for the function.
        2. Given equations of sinusoidal functions, identify the phase shift, horizontal shift, amplitude, period and midline and draw the graph.
        3. Investigate and express understanding of given transformations in the context of applications.
    2. Fit sinusoidal functions to data.
6. Fit sinusoidal functions to data analytically using the concepts of horizontal shift, amplitude, period and midline.
7. Investigate and express understanding of the models in the context of applications.
5. Develop an understanding and skill in solving trigonometric equations symbolically and graphically in real world settings.
    1. Simplify an expression using the fundamental identities (Pythagorean, reciprocal).
    2. Recognize and apply identities including the cofunction, sum and differences, double and half angle, product to sum identities.
    3. Define the inverse trigonometric functions.
        1. Understand the domain and range restrictions.
        2. Understand how to use the inverse functions to find all solutions to a trigonometric equation.
    4. Find the general solution of a trigonometric equation symbolically and graphically, using exact values where appropriate.
    5. Find the solutions of trigonometric equations given domain constraints, using exact values where appropriate.
    6. Algebraically verify trigonometric identities.
    7. Distinguish between trigonometric identities which are always true and trigonometric equations which may or may not have solutions.
    8. Solve applied problems using trigonometry.
6. Develop an understanding and skill in solving problems using the Law of Cosines and the Law of Sines.
    1. Solve given triangles using the Law of Sines as appropriate; identify and solve the ambiguous case.
    2. Solve given triangles using the Law of Cosines as appropriate.
    3. Solve applications involving oblique triangles.
7. Develop an understanding and skill in the use of polar coordinates, vectors and parametric equations and explore their use in real world settings.

1. Polar Coordinates.

1. Plot points and simple graphs in polar coordinates.
2. If time permits, explore rose curves, lemniscates and limiçons using technology.

2. Vectors.

1. Define a vector using magnitude and direction.
2. Represent a vector in various forms, e.g., $\vec{w}$ =3ı^ +4ȷ^ =⟨3,4⟩w⟶=3ı^+4ȷ^=⟨3,4⟩.
3. Apply vector operations of scalar multiplication, addition, and subtraction graphically and symbolically.
4. Create unit vector in same direction as a given vector.
5. Compute the dot product of two vectors.
6. Understand the significance of the sign of the dot product as it applies to the orientation of the vectors.
7. Find the angle between two vectors using the dot product.

6. Investigate at least two of the following applications.

- Tension in cables.
- Work.
- Component forces on objects.
- Navigation.
- Velocity vectors.
- Other appropriate applied problems.

2. Parametric Equations.
    1. Use parametric equations to describe horizontal and vertical components of motion over time.
    2. Apply parametric equations to problems involving circular and elliptical motion, and/or parabolic trajectories.
    3. Write parameterizations of circles and ellipses.
3. Implicit Equations.

1. Use circles and ellipses as examples of implicitly defined equations.

8. Develop an understanding and skill in solving problems involving operations on complex numbers.
    1. Define a complex number and perform conversions between, and arithmetic operations on, rectangular and polar forms.
    2. If time permits, use Euler's formula to find an nth root of a complex number algebraically.
9. Use technology to enhance the understanding of concepts in the course.
    1. Select the appropriate mode for degrees and radians on the calculator.
    2. Conversion of fractions of a degree to minutes and seconds.
    3. Graphing parametric equations.
    4. Graphing polar equations.
10. Perform conversions between rectangular and polar coordinates.
3. Graph trigonometric equations in radian and degree modes in appropriate windows.

1. Solve trigonometric equations graphically.

**Course Details**

*Learning Expectations*

Materials/Texts

**Textbook:** Precalculus: Concepts Through Functions. Sullivan and Sullivan. Check this textbook out from the library.

Computer

Course Content and Schedule:

**Students must demonstrate understanding of the following topics:**

**Semester 1/Quarter 1:**

Unit 1 – Functions

Unit 2 – Polynomials and Rational Functions

Unit 3 – Exponential and Logarithmic Functions

**Semester 2/Quarter 2: Unit 1 – Angles and Periodic Functions**

Unit 2 – Analytic Trigonometry

Unit 3 – Applications of Trigonometry Unit 4 – Polar Coordinates and Vectors Unit 5 – Parametric Equations

**Demonstrating understanding is generally defined as passing the individual tests with a C or better, and passing the final exam with a C or better.**

Due to the new 2020-2021 calendar, students will complete the first semester material by November 5th, 2020. The second semester will conclude January 28th, 2021.

Differentiation/accessibility strategies and supports (TAG, ELL, SpEd, other):

Our new textbook is a great starting point for students who want to exceed the course requirements in this class. The book contains supplemental topics and provides great examples on application problems in each section. For students who are new to a textbook in math, I provide teacher-made notes and have the key to the notes scanned and available on my website after each class period.

Class time is time for feedback, group work, investigations, and demonstrating understanding. During this time the habits of interaction that will be encouraged and modeled include:

-Time to think independently before working collaboratively

-Time to explain your reasoning

-Demonstrating how to listen to understand in groups

-Exploring multiple pathways to solve problems

-Time to explore and compare logic in our ideas and thinking -Time to critique and debate mathematically

Students will be given 15 minutes to revise work after all individual tests (not the final exam). This will occur during class time the class period following the test day. Students who miss this class need to make revisions within two school days of the revision period.

The class is really geared toward being a TAG student with escapes for students who are struggling or overwhelmed. For instance the homework load can be reduced for those students that have time issues or sped issues.

Safety issues and requirements (if applicable):
n/a

Classroom norms and expectations:

During full group zoom calls students will: -Mute when not talking

-Be respectful of others

-Turn video on when comfortable

In breakout rooms:

1) Have Mic On and Talk with each other

2) Turn Camera on when possible

3) Be respectful

4) Listen and help each other

5) Stay on task

*Evidence of Course Completion*

Assessment of Progress and Achievement:

10% of overall grade is based on assignments

90% of overall grade is on tests.

**Feedback:** As students complete coursework, they will be given timely and specific feedback regarding their performance. ***It is imperative that they stay current with the coursework so they can get feedback in time for the tests.*** Students will receive this feedback through multiple forms. Comments on turned in work, auto-generated replies

when using an app, peer-to-peer review, and self-diagnosis based on a teacher generated answer key will all serve students as they improve their skills.

**Assignment:** With distance learning, virtually every assignment is homework. I do however provide practice problems for students to complete outside of class. I provide an answer key for these problems in the following class. It is very important for students to check their answers for accuracy and understanding. Students should model their work after mine as I demonstrate what it looks like to have correct work.

**Review and Basic Quizzes:** I will provide students an opportunity to access documents that look very similar to a test format throughout each unit. They will complete work, take a picture of it, and submit that work via Canvas. These are opportunities to have students get their work examined by me and correct it if needed. Although most test reviews are comprehensive to that unit, students should also be reviewing any course material that was covered in that unit (or previous ones).

**Tests:** Students will take tests during the synchronous time we have during the week. Students will be permitted to work collaboratively on these tests with students who are also enrolled in my precalculus class and who are attending that day in our zoom call. Students will be sent to breakout rooms to collaborate. Students will complete the test in the allotted time that day and submit their work by the end of class by taking a picture of their hand-written work and uploading it to Canvas. If a student is absent, they can arrange a time to take a new version of that test with me. Students who miss a test will be given a zero until that test is made up. Students should make every effort to communicate about missing class and especially missing a test day to me. Students should make up tests in a timely manner (as soon as possible). In most cases, make up tests should happen within a week of when it was assigned.

**Test Retakes:** Test retakes are simply an opportunity to revisit the test. Students will have a chance to retake each test. This time will not be collaborative in nature and students should expect to work independently. The policy for test retakes follows the policy of testing in terms of missing class. Students should complete this in a timely manner and communicate with me regarding conflicts.

**Communication:** I make every attempt to work with students who may have a special circumstance for which I have not foreseen and created policy within this syllabus. The policies you see here are a guideline and should be discussed with me if it ends up applying to you. If there are barriers that are preventing your success in this course, I want to know about them so I can help you navigate towards successful completion of this course.

Progress Reports/Report Cards (what a grade means):

**90-100% - A**

**80-89% - B**

**70-79% - C**

**60-69% - D**

**0-59% - F**

Career Related Learning Experience (CRLEs) and Essential Skills:
N/A

**Communication with Parent/Guardian**

What methods are used to communicate curriculum, successes, concerns, etc.?

Email: Kdenney@pps.net

Text: 503-866-6003

**Personal Statement and other needed info**

**Please keep in mind that attendance does not necessarily mean that the student was in the zoom class. It could be that they just had some time of contact for that day.**