

## Rumson-Fair Haven Regional High School Curriculum

**Course:** *Precalculus*

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**Board Approval:** September 2022

**Revision Approval:** January 2025

### **Section I: Course Description**

*Precalculus* is primarily concerned with developing the student's understanding of the concepts of *Precalculus* and providing experiences with its methods and applications. The course emphasizes a multi-representational approach to *Precalculus*, with concepts, results, and problems being expressed graphically, numerically, analytically (algebraically), and verbally. The connections among these representations are also important. Broad concepts and widely applicable methods are emphasized. The focus of the course is neither manipulation nor memorization of an extensive taxonomy of functions, curves, theorems, or problem types. Although facility with manipulation and computational competence are important outcomes, they are not the core of this course. Technology will be used regularly by students to reinforce the relationships among multiple representations of functions, to confirm written work, to implement experimentation, and to assist in interpreting results.

### **Section II: NJSL: New Jersey Student Learning Standards/Learning Objectives**

1. **2023 New Jersey Student Learning Standards – Mathematics:**
  - “A New Jersey education in Mathematics builds quantitatively and analytically literate citizens prepared to meet the demands of college and career, and to engage productively in an information-driven society; ...A high-quality mathematics education fosters a population that...leverages data in decision-making and as a lens for discussing, analyzing, and responding to practical questions, persists to make sense of and model problems arising in everyday life, society, and the workplace, thinks critically and strategically to assess quantitative relationships and to solutions to complex problems, employs precise reasoning and constructs viable arguments to deduce conclusions, recognize false statements and assess peers' reasoning, interprets, evaluates and critiques the mathematics embedded in social, scientific and commercial systems, as well as the claims made in the private and public sectors, communicates precisely when conveying, representing, and justifying both qualitative and quantitative perspectives.”
2. **2023 New Jersey Student Learning Standards English Language Arts:**
  - A New Jersey education in English Language Arts builds readers, writers, and communicators prepared to meet the demands of college and career and to engage as productive American citizens with global responsibilities. ...Students will develop the necessary skills in reading, writing, speaking, and listening that are the foundations for creative and purposeful expression in language read rich, challenging texts that build their knowledge of the world, grow their confidence and identities as readers, and develop critical thinking skills and vocabulary necessary for long-term success[; e]ngage in regular, meaningful, writing authentic tasks, exploring valued topics, writing for impact and expression, and sharing their work with others (including authentic audiences) leverage complex texts and digital media to develop comprehension, active listening, and discussion skills ground daily writing and discussion in evidence, fostering an ability to read critically, build arguments, cite evidence, and communicate ideas to contribute meaningfully as productive citizens evaluate the reliability, credibility, and perspective of authors and speakers across all forms of media express ideas and knowledge through a variety of modalities and media, and serve as effective communicators who purposefully read, write, and speak across multiple disciplines [and l]earn to persist in reading complex texts, establishing lifelong habits to read voluntarily for pleasure, for further education, for information on public policy, and for advancement in the workplace.
3. **Standard 8.1 (Computer Science) and 8.2 (Design Thinking) of the 2020 NJSL:**
  - “The ‘Intent and Spirit of the Computer Science and Design Thinking Standards’ is to focus on deep understanding of concepts that enable students to think critically and systematically about leveraging technology to solve local and global issues. Authentic learning experiences that enable students to apply content knowledge, integrate concepts across disciplines, develop computational thinking skills, acquire and incorporate varied perspectives, and communicate with diverse audiences about the use and effects of computing prepares New Jersey students for college and careers.”
4. **Standard 9.4 (Life Literacies and Key Skills) of the 2020 NJSL:**
  - “This standard outlines key literacies and technical skills such as critical thinking, global and cultural awareness, and technology literacy\* that are critical for students to develop to live and work in an interconnected global economy.”
  - **Climate Change:** The state of New Jersey has mandated instruction in, “Climate Change across all content areas, leveraging the passion students have shown for this critical issue and providing them

opportunities to develop a deep understanding of the science behind the changes and to explore the solutions our world desperately needs.”

5. **\*Amistad Law: N.J.S.A. 18A 52:16A-88:**
  - The inclusion of lessons and resources/texts dealing with the African slave trade, slavery in America, the vestiges of slavery in this country and the contributions of African-Americans to our society will be implemented in English and Social Studies courses in accordance with state law: “Every board of education shall incorporate the information regarding the contributions of African-Americans to our country in an appropriate place in the curriculum of elementary and secondary school students.”
6. **\*Holocaust Law: N.J.S.A. 18A 35-28:**
  - The inclusion of lessons and resources/texts that enable pupils to identify and analyze applicable theories concerning human nature and behavior; to understand that genocide is a consequence of prejudice and discrimination; and to understand that issues of moral dilemma and conscience have a profound impact on life will be implemented in English and Social Studies courses in accordance with state law: “Every board of education shall include instruction on the Holocaust and genocides in an appropriate place in the curriculum of all elementary and secondary school pupils. The instruction shall further emphasize the personal responsibility that each citizen bears to fight racism and hatred whenever and wherever it happens.”
7. **\*LGBT and Disabilities Law: N.J.S.A. 18A:35-4.35:**
  - A transformative approach to the inclusion of lessons and resources/texts on the contributions and issues concerning the LGBTQ+ population and people with disabilities will be implemented across all core subjects in accordance with state law: “A board of education shall include instruction on the political, economic, and social contributions of persons with disabilities and lesbian, gay, bisexual, and transgender people, in an appropriate place in the curriculum of middle school and high school students as part of the district’s implementation of the New Jersey Student Learning Standards (N.J.S.A.18A:35-4.36). A board of education shall have policies and procedures in place pertaining to the selection of instructional materials to implement the requirements of N.J.S.A. 18A:35-4.35.”
8. **\*Asian American and Pacific Islanders Legislation: N.J.S.A 4021/A6100:**
  - The inclusion of lessons and resources/texts on the history and contributions of Asian Americans and Pacific Islanders, will enable New Jersey’s schools to provide a curriculum that reflects the diversity of our state. In accordance with state law: “A board of education shall include instruction on the history and contributions of Asian Americans and Pacific Islanders in an appropriate place in the curriculum of students in grades kindergarten through as part of the school district’s implementation of the New Jersey Student Learning Standards in Social Studies.”
9. Acquisition/development/refinement of the higher-order critical thinking skills aligned with the *Revised Bloom’s Taxonomy of Cognitive Objectives*

### **Section III: Curriculum Modifications**

The *Precalculus* curriculum is subject to case-by-case modifications to support/advance the needs of all students, including special education students, English language learners, gifted students, and those at risk of school failure. These modifications are based on Individualized Learning Programs (IEPs), recommendations made by the district’s English Language Learners (ELL) coordinator, feedback from members of the Intervention & Referral Services Team (*I&RS*) for at-risk students, and 504 Plans.

Coursework and assessments will be modified on an individual basis for students when necessary. Modifications may include but are not limited to those outlined on the [Modifications/Accommodations for Mathematics Courses](#) chart.

### **Section IV: Preparation for Standardized Testing**

Instruction in *Precalculus* is aligned with the requirements of state and national standardized assessments, including the *NJGPA*, *NJSLA*, the *ACT*, the *PSAT*, and the *SAT*.

### **Section V: Curriculum Pacing Guide**

Curriculum Pacing Guide	
Course Title: <i>Precalculus</i>	Grade Level: 11

<b>Unit I:</b> Solving Equations Review	Weeks 1-5
<b>Unit II:</b> Graphing Functions Review	Weeks 6-10
<b>Unit III:</b> Symmetry, Function Notation, and Operations with Functions	Weeks 11-14
<b>Unit IV:</b> Rational Functions	Weeks 15-18
<b>Unit V:</b> Trigonometric Functions and their Graphs	Weeks 19-24
<b>Unit VI:</b> Trigonometric Identities, Proofs and Equations	Week 25-30
<b>Unit VII:</b> Law of Sines and Cosines	Weeks 31-33
<b>Unit VIII:</b> Matrices	Weeks 34-36
<b>Unit IX:</b> Introduction to Limits	Weeks 37-40

### **Section VI: Technology Skills**

Students in *Precalculus* are required to complete the technology skills components of the curriculum:

- Kuta
- TI-89 Calculator
- Desmos
- Google Sheets/Slides/Docs

### **Section VII: Primary Texts and Year-Long Instructional Resources**

The following texts and instructional resources are employed in *Precalculus*:

- Larson, Ron. [PreCalculus with Limits: A Graphing Approach 7th Edition](#), Houghton Mifflin Company, 2016
- [Math XL](#)
- [Common Sense Education](#)

### **Section VIII: Grading Formula and Assessment Modes**

Marking period grades in *Precalculus* are determined via a percentage weighting model. The specific grading categories and weightings of each will be determined prior to the start of each academic year and will be published in the posted/distributed course syllabi.

Assessments in *Precalculus* vary greatly in format, scope/content/skills assessed, and alternative assessments, differentiation in assessments and choice will be incorporated as appropriate. Preliminary assessments of each format will

be used as benchmarks and summative assessments will be created/revised collaboratively each year and planned by members of the *Precalculus* instructional team to inform future learning and to measure student growth.

### **Section IX: Unit Templates**

The following unit templates have been established for the *Precalculus* curriculum by the *Precalculus* instructional team:

<b>Unit I: Solving Equations Review</b>		
<b>Unit Summary</b>		
In this unit, students will solve equations and inequalities using algebraic, graphical, and geometric techniques. The equations and inequalities will involve expressions of the following types: polynomials (including quadratic), absolute value, and radical equations. Students will focus on creating equations to describe numbers or relationships and then understand solving equations as a process of reasoning.		
<b>Standards/Core Ideas/Performance Expectations</b>		
The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in <i>Precalculus</i> :		
<ul style="list-style-type: none"> <li>● <i>2023 New Jersey Student Learning Standards: Mathematics</i> <ul style="list-style-type: none"> <li>○ MP.1-8</li> <li>○ F.IF.A1-3, B.4-6, &amp; C.7-8</li> </ul> </li> <li>● <i>2023 New Jersey Student Learning Standards English Language Arts</i> <ul style="list-style-type: none"> <li>○ L.VL.11-12.3.A, W.AW.11-12.1.A &amp; E, W.IW.11-12.2.A, W.NW.11-12.3.A-E, SL.II.11-12.2, SL.PI.11-12.4, RI.MF.11-12.6</li> </ul> </li> <li>● <i>2020 New Jersey Student Learning Standards: Computer Science and Design Thinking</i> <ul style="list-style-type: none"> <li>○ 8.1.12.DA.1 &amp; 6</li> </ul> </li> <li>● <i>2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills</i> <ul style="list-style-type: none"> <li>○ 9.4.2.CI.1-2, 9.4.12.CT.2</li> </ul> </li> </ul>		
<b>Unit Essential Questions</b>	<b>Unit Enduring Understandings</b>	
<ul style="list-style-type: none"> <li>● Why is it important to solve different types of equations?</li> </ul>	<ul style="list-style-type: none"> <li>● Equations arise naturally in many applications. To interpret the graphs of various functions in an application setting, a student must have the ability to understand the algebraic concepts involved with the different functions and equations.</li> </ul>	
<b>Evidence of Learning</b>		
<b>Formative &amp; Alternative Assessments:</b> <ul style="list-style-type: none"> <li>● Classwork</li> <li>● Homework</li> <li>● Performance activities</li> <li>● Solving Problem Set</li> <li>● Solving Quiz</li> <li>● Individual student check-ins with teacher</li> </ul>	<b>Benchmark &amp; Summative Assessments:</b> <ul style="list-style-type: none"> <li>● Solving Test (Benchmark)</li> </ul>	<b>Resources Needed:</b> <ul style="list-style-type: none"> <li>● Larson Precalculus with Limits</li> <li>● TI-89</li> <li>● Kuta Software</li> <li>● Various teacher made PowerPoints and WSs</li> <li>● MathXL</li> </ul>

<b>Unit II: Graphing Review</b>		
<b>Unit Summary</b>		
In this unit, students will also address functions and their graphs, transformation, operations on functions, inverse functions, and rates of change. Students will also sketch and analyze graphs of quadratic functions, use long division and synthetic division to divide polynomials, determine the number of rational and real zeros of polynomial functions find the zeros, and perform operations with complex numbers. Students will also graph absolute value and radical functions using their transformations and key characteristics.		
<b>Standards/Core Ideas/Performance Expectations</b>		
The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in <i>Precalculus</i> :		
<ul style="list-style-type: none"> <li>● <i>2023 New Jersey Student Learning Standards: Mathematics</i> <ul style="list-style-type: none"> <li>○ MP.1-8</li> <li>○ N.RN.A.1-2, N.Q.A.1, A.SSE.A.1a, A.2 &amp; B.3a, A.CED.A.1-2, A.REI.A.1-3, F.IF.A.1-3, B.4-6 &amp; C.7-8</li> </ul> </li> <li>● <i>2023 New Jersey Student Learning Standards English Language Arts</i></li> </ul>		

<ul style="list-style-type: none"> <li>○ L.VL.11-12.3.A, W.AW.11-12.1.A &amp; E, W.IW.11-12.2.A, W.NW.11-12.3.A-E, SL.II.11-12.2, SL.PI.11-12.4, RI.MF.11-12.6</li> <li>● 2020 New Jersey Student Learning Standards: <i>Computer Science and Design Thinking</i> <ul style="list-style-type: none"> <li>○ 8.1.12.DA.1 &amp; 6</li> </ul> </li> <li>● 2020 New Jersey Student Learning Standards: <i>Career Readiness, Life Literacies and Key Skills</i> <ul style="list-style-type: none"> <li>○ 9.4.2.CI.1-2, 9.4.12.CT.2</li> </ul> </li> </ul>		
<b>Unit Essential Questions</b>		<b>Unit Enduring Understandings</b>
<ul style="list-style-type: none"> <li>● How can we graph a function?</li> <li>● Why is it important to be able to graph various types of functions?</li> </ul>		<ul style="list-style-type: none"> <li>● Graphing functions and the understanding of the behavior functions are the basic building blocks of higher-level mathematics courses.</li> <li>● Graphing equations helps students to understand their applications in real life. The interpretation of the graph will assist students in solving the question and making connections to their real-life applications.</li> </ul>
<b>Evidence of Learning</b>		
<b>Formative &amp; Alternative Assessments:</b>	<b>Benchmark &amp; Summative Assessments:</b>	<b>Resources Needed:</b>
<ul style="list-style-type: none"> <li>● Classwork</li> <li>● Homework</li> <li>● Desmos polygraph</li> <li>● Graphing Quiz</li> <li>● Individual student check-ins with teacher</li> </ul>	<ul style="list-style-type: none"> <li>● Benchmark Cooperative Assessment</li> <li>● Unit Test</li> </ul>	<ul style="list-style-type: none"> <li>● Larson Precalculus with Limits</li> <li>● TI-89</li> <li>● Kuta Software</li> <li>● Various teacher made PowerPoints and WSs</li> <li>● MathXL</li> </ul>

<b>Unit III: Symmetry, Function Notation, and Operations with Functions</b>		
<b>Unit Summary</b>		
<p>In this unit, students will address functions and their domain, graphs, transformations, operations on functions, and inverse functions. The concept of function symmetry will be introduced. The students will expand on their knowledge of graphs by graphing quadratic functions in vertex and standard form. They will then examine the key components and be able to interpret functions in applications in terms of their context and function notation.</p>		
<b>Standards/Core Ideas/Performance Expectations</b>		
<p>The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in <i>Precalculus</i>:</p> <ul style="list-style-type: none"> <li>● 2023 New Jersey Student Learning Standards: <i>Mathematics</i> <ul style="list-style-type: none"> <li>○ MP.1-8</li> <li>○ N.RN.A.1-2, N.Q.A.1, A.SSE.A.1a, A.2 &amp; B.3a, A.CED.A.1-2, A.REI.A.1-3, F.IF.A.1-3, B.4-6&amp;C.7-8</li> </ul> </li> <li>● 2023 New Jersey Student Learning Standards <i>English Language Arts</i> <ul style="list-style-type: none"> <li>○ L.VL.11-12.3.A, W.AW.11-12.1.A &amp; E, W.IW.11-12.2.A, W.NW.11-12.3.A-E, SL.II.11-12.2, SL.PI.11-12.4, RI.MF.11-12.6</li> </ul> </li> <li>● 2020 New Jersey Student Learning Standards: <i>Computer Science and Design Thinking</i> <ul style="list-style-type: none"> <li>○ 8.1.12.DA.1 &amp; 6</li> </ul> </li> <li>● 2020 New Jersey Student Learning Standards: <i>Career Readiness, Life Literacies and Key Skills</i> <ul style="list-style-type: none"> <li>○ 9.2.12.CAP.2-3, 9.4.12.CI.1, 9.4.12.CT.2, 9.4.12.DC.7</li> </ul> </li> </ul>		
<b>Unit Essential Questions</b>		<b>Unit Enduring Understandings</b>
<ul style="list-style-type: none"> <li>● How can we identify the symmetry of a function?</li> <li>● How do we perform operations on functions?</li> <li>● Why is it important to understand function notation?</li> </ul>		<ul style="list-style-type: none"> <li>● The symmetry of a function can be determined algebraically and graphically.</li> <li>● We can add, subtract, multiply, and divide functions, as well as compose functions and find their inverses.</li> <li>● The concept of a function and function notation are central to modern mathematics and its applications. In this chapter, students will review functions, operations on functions, and how to use function notation. Then students will develop skills in constructing and interpreting graphs of functions. These skills will be essential as we apply them to applications involving motion, revenue, and communications.</li> </ul>
<b>Evidence of Learning</b>		
<b>Formative &amp; Alternative Assessments:</b>	<b>Benchmark &amp; Summative Assessments:</b>	<b>Resources Needed:</b>
<ul style="list-style-type: none"> <li>● Classwork</li> </ul>	<ul style="list-style-type: none"> <li>● Symmetry Cooperative</li> </ul>	<ul style="list-style-type: none"> <li>● Larson Precalculus with Limits</li> <li>● TI-89</li> </ul>

<ul style="list-style-type: none"> <li>• Homework</li> <li>• Function Matching Activity</li> <li>• Domain Around-The-Room Activity</li> <li>• Function Quiz</li> <li>• Individual student check-ins with teacher</li> </ul>	<p>Assessment</p> <ul style="list-style-type: none"> <li>• Unit Test</li> </ul>	<ul style="list-style-type: none"> <li>• Kuta Software</li> <li>• Various teacher made PowerPoints and WSs</li> <li>• MathXL</li> </ul>
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Unit IV: Rational Functions		
Unit Summary		
<p>In this unit, students will be exploring rational functions. Students will address rational functions and identify key components of their graphs. Students will determine whether the function is even or odd, and identify whether there is symmetry. Students will sketch and analyze graphs of rational functions, including end behavior. Students will also perform operations with rational expressions and solve rational equations.</p>		
Standards/Core Ideas/Performance Expectations		
<p>The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in <i>Precalculus</i>:</p> <ul style="list-style-type: none"> <li>• <i>2023 New Jersey Student Learning Standards: Mathematics</i> <ul style="list-style-type: none"> <li>○ MP1-8</li> <li>○ F.IF.B.4-5 &amp; C.7-8, F-BF.B.3, A.REI.A.2</li> </ul> </li> <li>• <i>2023 New Jersey Student Learning Standards English Language Arts</i> <ul style="list-style-type: none"> <li>○ L.VL.11-12.3.A, W.AW.11-12.1.A &amp; E, W.IW.11-12.2.A, W.NW.11-12.3.A-E, SL.II.11-12.2, SL.PI.11-12.4, RI.MF.11-12.6</li> </ul> </li> <li>• <i>2020 New Jersey Student Learning Standards: Computer Science and Design Thinking</i> <ul style="list-style-type: none"> <li>○ 8.1.12.DA.1 &amp; 6</li> </ul> </li> <li>• <i>2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills</i> <ul style="list-style-type: none"> <li>○ 9.2.12.CAP.2-3, 9.4.12.CI.1, 9.4.12.CT.2, 9.4.12.DC.7</li> </ul> </li> </ul>		
Unit Essential Questions	Unit Enduring Understandings	
<ul style="list-style-type: none"> <li>• What are the key features of the graph of a rational function?</li> <li>• How do you solve a rational equation?</li> </ul>	<ul style="list-style-type: none"> <li>• Intercepts, holes, and asymptotes are used to graph rational functions. Holes and vertical asymptotes are created because of restrictions in the function's domain. Horizontal asymptotes dictate the end behavior of the graph.</li> <li>• All terms in a rational equation should be multiplied by the common denominator to effectively solve a rational equation. Restrictions on the domain may affect the number of solutions.</li> </ul>	
Evidence of Learning		
<p><b>Formative &amp; Alternative Assessments:</b></p> <ul style="list-style-type: none"> <li>• Classwork</li> <li>• Homework</li> <li>• Rational Graph Quiz</li> <li>• Individual student check-ins with teacher</li> </ul>	<p><b>Benchmark &amp; Summative Assessments:</b></p> <ul style="list-style-type: none"> <li>• Rational Function Unit Assessment</li> </ul>	<p><b>Resources Needed:</b></p> <ul style="list-style-type: none"> <li>• Larson Precalculus with Limits</li> <li>• TI-89</li> <li>• Kuta Software</li> <li>• Various teacher made PowerPoints and WSs</li> <li>• MathXL</li> </ul>

Unit V: Trigonometric Functions and Their Graphs		
Unit Summary		
<p>In this unit, students will describe an angle and convert between degree and radian measure, identify a unit circle and describe its relationship to real numbers, evaluate trigonometric functions of any angle, evaluate inverse trigonometric functions, and evaluate the composition of trigonometric functions. Students will also study graphs of the six trigonometric functions. They will apply prior knowledge of reflections, stretches, compressions, shifts, and symmetry to the new trigonometric functions. Some new vocabulary terms associated with applying these concepts are: periodic graphs, amplitudes, and phase shifts.</p>		
Standards/Core Ideas/Performance Expectations		
<p>The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in <i>Precalculus</i>:</p> <ul style="list-style-type: none"> <li>• <i>2023 New Jersey Student Learning Standards: Mathematics</i> <ul style="list-style-type: none"> <li>○ MP1-8</li> </ul> </li> </ul>		

- N.Q.A.1, F.IF.B.4-5 & C.9, F.BF.A.1 & B.3, F.TF.A.1-4 & B.5-7
- *2023 New Jersey Student Learning Standards English Language Arts*
  - L.VL.11-12.3.A, W.AW.11-12.1.A & E, W.IW.11-12.2.A, W.NW.11-12.3.A-E, SL.II.11-12.2, SL.PI.11-12.4, RI.MF.11-12.6
- *2020 New Jersey Student Learning Standards: Computer Science and Design Thinking*
  - 8.1.12.DA.1 & 6
- *2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills*
  - 9.2.12.CAP.2-3, 9.4.12.CI.1, 9.4.12.CT.2, 9.4.12.DC.7

Unit Essential Questions	Unit Enduring Understandings
<ul style="list-style-type: none"> <li>● What is the foundation of trigonometry?</li> <li>● What is the relationship between degrees and radians?</li> <li>● How do we locate angles given in radians?</li> <li>● How are trig functions evaluated?</li> <li>● How are trig graphs used in mathematical modeling?</li> <li>● How can transformations be used to graph trig functions?</li> </ul>	<ul style="list-style-type: none"> <li>● A right triangle can be used to create all trig ratios and additional concepts.</li> <li>● Degrees measure the angle whereas radians measure the corresponding arc of the unit circle.</li> <li>● Radians are based on a circle with a circumference of <math>2\pi</math> and the x and y axis can help create the unit circle to place angles in the appropriate location.</li> <li>● Using a right triangle (especially the special right triangles) and the unit circle, trig functions can be evaluated by hand.</li> <li>● Sine and cosine functions can be used to model many real-life situations, including electric currents, musical tones, radio waves, tides, and weather patterns.</li> <li>● Transformations are used to graph different trigonometric functions.</li> </ul>

#### Evidence of Learning

Formative & Alternative Assessments:	Benchmark & Summative Assessments:	Resources Needed:
<ul style="list-style-type: none"> <li>● Classwork</li> <li>● Homework</li> <li>● Graphing with Desmos</li> <li>● Desmos Polygraph</li> <li>● Graphing Presentations</li> <li>● Evaluating Quiz</li> <li>● Graphing Quiz</li> <li>● Inverse Quiz</li> <li>● Individual student check-ins with teacher</li> </ul>	<ul style="list-style-type: none"> <li>● Graphing Cooperative</li> </ul>	<ul style="list-style-type: none"> <li>● Larson Precalculus with Limits</li> <li>● Desmos</li> <li>● TI-89</li> <li>● Kuta Software</li> <li>● Various teacher made PowerPoints and WSs</li> <li>● MathXL</li> </ul>

### Unit VI: Trigonometric Identities, Proofs, and Equations

#### Unit Summary

In this unit, students will use fundamental trigonometric identities to evaluate trigonometric functions and simplify trigonometric expressions, verify trigonometric identities, use standard algebraic techniques, and use sum and difference formulas and multiple angle formulas. All of these identities are used to rewrite and evaluate trigonometric functions. Students will solve trigonometric equations using algebraic methods. Most algebraic methods will require factoring and the use of inverse trigonometric functions and identities.

#### Standards/Core Ideas/Performance Expectations

The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in *Precalculus*:

- *2023 New Jersey Student Learning Standards: Mathematics*
  - MP.1-8
  - A-REI.A.1, F.TF.B.7 & C.9
- *2023 New Jersey Student Learning Standards English Language Arts*
  - L.VL.11-12.3.A, W.AW.11-12.1.A & E, W.IW.11-12.2.A, W.NW.11-12.3.A-E, SL.II.11-12.2, SL.PI.11-12.4, RI.MF.11-12.6
- *2020 New Jersey Student Learning Standards: Computer Science and Design Thinking*
  - 8.1.12.DA.1 & 6
- *2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills*
  - 9.2.12.CAP.2-3, 9.4.12.CI.1, 9.4.12.CT.2, 9.4.12.DC.7

Unit Essential Questions	Unit Enduring Understandings	
<ul style="list-style-type: none"> <li>• What skills will students use to simplify trig expressions?</li> <li>• Where do the identities come from?</li> <li>• How are the trig inverses functions?</li> <li>• How are trig equations solved?</li> </ul>	<ul style="list-style-type: none"> <li>• Foundational algebra skills (factoring, combining like terms, canceling, common denominators, conjugates) can be used to simplify trig expressions using the trig identities.</li> <li>• A right triangle and the Pythagorean Theorem can be used to prove all identities.</li> <li>• The input and output of the trig inverses are restricted.</li> <li>• Trigonometric equations use foundational algebra concepts and identities to be solved.</li> </ul>	
Evidence of Learning		
<b>Formative &amp; Alternative Assessments:</b> <ul style="list-style-type: none"> <li>• Classwork</li> <li>• Homework</li> <li>• Solving Quiz</li> <li>• Individual student check-ins with teacher</li> </ul>	<b>Benchmark &amp; Summative Assessments:</b> <ul style="list-style-type: none"> <li>• Identity Cooperative</li> <li>• Sum/Difference/Double Angle Assessment</li> <li>• Unit Assessment</li> </ul>	<b>Resources Needed:</b> <ul style="list-style-type: none"> <li>• Larson Precalculus with Limits</li> <li>• TI-89</li> <li>• Kuta Software</li> <li>• Various teacher made PowerPoints and WSs</li> <li>• MathXL</li> </ul>

Unit VII: Law of Sines and Cosines		
Unit Summary		
<p>In this unit, students will use the Law of Sines and the Law of Cosines to solve oblique triangles and find areas of oblique triangles. Students will also apply the Law of Sines and the Law of Cosines to real-world problems and situations.</p>		
Standards/Core Ideas/Performance Expectations		
<p>The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in <i>Precalculus</i>:</p> <ul style="list-style-type: none"> <li>• <i>2023 New Jersey Student Learning Standards: Mathematics</i> <ul style="list-style-type: none"> <li>○ MP1-8</li> <li>○ G.CO.C.10, G.SRT.D.9-11, G.MG.A.3</li> </ul> </li> <li>• <i>2023 New Jersey Student Learning Standards English Language Arts</i> <ul style="list-style-type: none"> <li>○ L.VL.11-12.3.A, W.AW.11-12.1.A &amp; E, W.IW.11-12.2.A, W.NW.11-12.3.A-E, SL.II.11-12.2, SL.PI.11-12.4, RI.MF.11-12.6</li> </ul> </li> <li>• <i>2020 New Jersey Student Learning Standards: Computer Science and Design Thinking</i> <ul style="list-style-type: none"> <li>○ 8.1.12.DA.1 &amp; 6</li> </ul> </li> <li>• <i>2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills</i> <ul style="list-style-type: none"> <li>○ 9.2.12.CAP.2-3, 9.4.12.CI.1, 9.4.12.CT.2, 9.4.12.DC.7</li> </ul> </li> </ul>		
Unit Essential Questions	Unit Enduring Understandings	
<ul style="list-style-type: none"> <li>• What is the purpose of the Law of Sines and the Law of Cosines?</li> <li>• Are there other “formulas” for the area of a triangle?</li> </ul>	<ul style="list-style-type: none"> <li>• The Law of Sines and Cosines is derived from right triangles but can be extended to oblique triangles to solve for missing sides and angles.</li> <li>• Using <math>\text{Area} = 1/2bh</math>, a trigonometric form of this formula can be used in a triangle with an unknown height. Heron’s formula can be used when 3 sides of the triangle are known.</li> </ul>	
Evidence of Learning		
<b>Formative &amp; Alternative Assessments:</b> <ul style="list-style-type: none"> <li>• Classwork</li> <li>• Homework</li> <li>• Application Presentations</li> <li>• Law of Sines/Cosines Quiz</li> <li>• Individual student check-ins with teacher</li> </ul>	<b>Benchmark &amp; Summative Assessments:</b> <ul style="list-style-type: none"> <li>• Unit Project: Area of a Plot of Land</li> </ul>	<b>Resources Needed:</b> <ul style="list-style-type: none"> <li>• Larson Precalculus with Limits</li> <li>• TI-89</li> <li>• Kuta Software</li> <li>• Various teacher made PowerPoints and WSs</li> <li>• MathXL</li> <li>• Common Sense Lesson: <a href="#">Is the Internet Making You Meaner</a></li> </ul>

Unit VIII: Matrices		
Unit Summary		

In this unit, students will use matrices to represent data and perform matrix operations using a graphing utility. Students will be able to perform addition, subtraction, and multiplication of matrices along with solving systems of equations using matrices.

### Standards/Core Ideas/Performance Expectations

The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in *Precalculus*:

- 2023 New Jersey Student Learning Standards: Mathematics
  - MP1-8
  - N.VM.C.6-8, A.REI.C.5
- 2023 New Jersey Student Learning Standards English Language Arts
  - L.VL.11-12.3.A, W.AW.11-12.1.A & E, W.IW.11-12.2.A, W.NW.11-12.3.A-E, SL.II.11-12.2, SL.PI.11-12.4, RI.MF.11-12.6
- 2020 New Jersey Student Learning Standards: Computer Science and Design Thinking
  - 8.1.12.DA.1 & 6
- 2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies, and Key Skills
  - 9.2.12.CAP.2-3, 9.4.12.CI.1, 9.4.12.CT.2, 9.4.12.DC.7

### Unit Essential Questions

- How is a matrix represented?
- How are matrix operations performed?
- What mathematical concept can matrices be used for?

### Unit Enduring Understandings

- A matrix is an array of numbers.
- Operations of addition, subtraction, and multiplication can be performed if the correct dimension conditions exist; all operations can be done using the TI-89 if the dimensions are compatible.
- Matrices can solve a multivariable system of equations.

### Evidence of Learning

#### Formative & Alternative Assessments:

- Classwork
- Homework
- Exit Slip
- Matrix Mini Quiz
- Individual student check-ins with teacher

#### Benchmark & Summative Assessments:

- Unit VIII Summative

#### Resources Needed:

- Larson Precalculus with Limits
- TI-89
- Kuta Software
- Various teacher made PowerPoints and WSs
- MathXL

## Unit IX: Introduction to Limits

### Unit Summary

In this unit, students will be introduced to limits and their properties. Students will evaluate limits graphically, algebraically, and using tables. Students will work with limits involving infinity and be able to make generalizations using limits that will incorporate various concepts from previous units.

### Standards/Core Ideas/Performance Expectations

The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in *Precalculus*:

- 2023 New Jersey Student Learning Standards: Mathematics
  - MP1-8
  - F.IF.B.4, 6 & C.9
- 2023 New Jersey Student Learning Standards English Language Arts
  - L.VL.11-12.3.A, W.AW.11-12.1.A & E, W.IW.11-12.2.A, W.NW.11-12.3.A-E, SL.II.11-12.2, SL.PI.11-12.4, RI.MF.11-12.6
- 2020 New Jersey Student Learning Standards: Computer Science and Design Thinking
  - 8.1.12.DA.1 & 6
- 2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills
  - 9.2.12.CAP.2-3, 9.4.12.CI.1, 9.4.12.CT.2, 9.4.12.DC.7

### Unit Essential Questions

- What is a limit?
- How can we use limits to describe functions behavior graphically or analytically?

### Unit Enduring Understandings

- A limit describes the behavior of a function as the input approaches a particular value.
- Limits can be calculated at any point on a graph or within a function to describe values that a graph/function approaches and can be linked to end behavior. Limits will be used as a foundation in calculus when continuity and differentiation are discussed.

Evidence of Learning		
<b>Formative &amp; Alternative Assessments:</b> <ul style="list-style-type: none"> <li>● Classwork</li> <li>● Homework</li> <li>● Exit Slip</li> <li>● Graphing with Limits Quiz</li> <li>● Evaluating Limits Algebraically Quiz</li> <li>● Individual student check-ins with teacher</li> </ul>	<b>Benchmark &amp; Summative Assessments:</b> <ul style="list-style-type: none"> <li>● Q4 Wrap-Up Summative</li> </ul>	<b>Resources Needed:</b> <ul style="list-style-type: none"> <li>● Larson Precalculus with Limits</li> <li>● TI-89</li> <li>● Kuta Software</li> <li>● Various teacher made PowerPoints and WSs</li> <li>● MathXL</li> </ul>

### Section X: Unit Reflection

The *Precalculus* instructional team must confer upon the completion of each instructional unit in the *Precalculus* curriculum and rate the degrees to which the instructional units meet performance criteria established by the New Jersey Department of Education using the Unit Reflection Form. Completed unit reflection forms must be submitted to the Department Supervisor for approval upon completion of curriculum implementation with a complementing list of suggested modifications to the *Precalculus* curriculum.

Unit Reflection Form: <i>Precalculus</i>			
Lesson Activities:	Strongly	Moderately	Weakly
Foster student use of technology as a tool to develop critical thinking, creativity, and innovation skills;			
Are challenging and require higher-order thinking and problem-solving skills;			
Allow for student choice;			
Provide scaffolding for acquiring targeted knowledge/skills;			
Integrate modern, global perspectives, especially those regarding diversity, genocide, global issues, and historical ones regarding racial relations;			
Integrate 21 <sup>st</sup> century skills;			
Provide opportunities for interdisciplinary connection and transfer of knowledge and skills;			
Are varied to address different student learning styles and preferences;			
Are differentiated based on student needs;			
Are student-centered with teacher acting as a facilitator and co-learner during the teaching and learning process;			
Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives;			
Provide opportunities for student reflection and self-assessment;			
Provide data to inform and adjust instruction to better meet the varying needs of learners.			

Writing instruction should happen across the RFH Community. Writing across the curriculum is a philosophy that advances the belief that writing is a method of learning. Since all departments are committed to helping students learn, writing must be used as a methodology to advance student learning.

Each academic discipline has its own unique conventions, formats and structures. It is the responsibility of each department to agree upon domain-specific writing praxes, model them for students, and require them to utilize them on a consistent basis. Students must understand that acceptable writing in one domain may not be acceptable writing in another area. The development of domain-specific writing skills supports the overall development of the student writer because all writing is grounded in the writing situation: audience, context, purpose, subject, and writer. Representatives from the academic disciplines must share their domain-specific writing praxes with each other, identify intersections, and determine how to address perceived gaps that limit student learning.

Students must experience writing situations that help them learn how to think creatively and critically and communicate effectively in the academic disciplines. Writing instruction, regardless of the academic discipline, must always reinforce student understanding of the writing situation. When students experience writing situations, they must study examples of domain-specific writing in order to understand how writers communicate in discipline-related contexts. This does not mean information embedded in textbooks. Domain-specific writing is writing that is used to inform and influence readers as it draws them into an established circle of discourse. Students must use these non-fiction texts to develop the close reading skills that will shape their own writing. Focused engagement with domain-specific writing should not be limited to basic reading comprehension and topical understanding. It must also include the analysis of the writing situation that is represented in the text: audience, context, purpose, subject, and writer. The close reading of well-written texts—regardless of the domain—will show students the importance of writing mechanics, diction, and syntax. The development of close reading skills will also help the students grow in terms of their ability to construct and advance independent and original claims that are well-supported by evidence. Domain-specific writing is grounded in positioning of claims and the effective use of evidence.

The final written product is important; nevertheless, the learning that results in this production must not be devalued. The writing process is not limited to the basic steps of planning, drafting, revising, and editing/proofreading. It is a complex sequence of critical and creative thinking and writing that leads to the production of a text that provides evidence of learning and understanding. Students must ultimately develop the ability to self-assess the effectiveness of their writing as a representation of the writing situation. Without the use of models that evidence learning and understanding, students will not develop the ability to self-assess their own work—the true outcome of the writing process.

### **What types of writing situations should RFH students engage in?**

RFH students should engage in writing situations across the curriculum that require them to:

- write to improve mechanical proficiency, diction usage, and syntactical sophistication
- write to narrate, describe, and reflect
- write to summarize and report
- write to classify and define
- write to explain how process leads to an outcome
- write to compare, contrast and evaluate
- write to speculate on cause and effect
- write to propose solutions and solve problems
- write to analyze

These writing situations should be positioned in a coordinated, developmental sequence that extends across the academic disciplines.

Upon Completion of Grade 12, RFH students must be ready to transition to the following writing situations:

- write to analyze
- write to persuade (argument)

The core focus of first-year college writing courses are analysis and argument. These courses orient the students to the demands and expectations of writing for the academic culture of college. At colleges/universities with carefully coordinated writing programs, students must demonstrate proficiency in analysis and argument before they transition to upper level courses that require them to engage in the following writing situation:

- write to investigate (research)