Course: *PreCalculus* Unit #1: Conics	Year of Implementation: 2025-2026

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Stage One - Desired Results

Link(s) to New Jersey Student Learning Standards for this course:
{provide all applicable links to standards here}
https://www.nj.gov/education/standards/

- **Unit Standards:**
  - ***Content Standards***
    - *https://www.nj.gov/education/standards/math/Docs/2023_NJSLS_Mathematics.docx*

    Expressing Geometric Properties with Equations   G.GPE
    A. Translate between the geometric description and the equation for a conic section
    1. Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
    2. Derive the equation of a parabola given a focus and directrix.
    3. Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.

    Modeling with Geometry   G.MG
    A. Apply geometric concepts in modeling situations
    1. Use geometric shapes, their measures, and their properties to describe objects.
    3. Apply geometric methods to solve design problems.

  - ***21st Century Life & Career Standards***
    - All curriculum writers/revisionists need to include standards that apply to "Career Readiness, Life Literacies, and Key Skills". This should include a brief description of the standard and the standard number. Document only those standards and practices that apply to each unit. Use the following link to assist you [see pages of 31-36; 41-42; 53-56 for specific standard #'s and strands]

- 9.4.12.CT.2 Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
- 9.4.12.CI.1 Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
- 9.4.12.TL.3 Analyze the effectiveness of the process and quality of collaborative environments.

- ○ ***Interdisciplinary Content Standards***
  - ■ SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
  - ■ SL.11-12.4 Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.
  - ■ L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

- ○ ***NJ Statutes:*** NJ State law mandates the inclusion of the following topics in lesson design and instruction as aligned to elementary and secondary curriculum.

  Amistad Law: N.J.S.A. 18A 52:16A-88 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.

  Holocaust Law: N.J.S.A. 18A:35-28 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.

Transfer Goal: Students will be able to independently use their knowledge to analyze the connections between symbolic and physical representations.

As aligned with LRHSD Long Term Learning Goal(s):https://www.lrhsd.org/academics/program-of-studies/curriculum

1. Problem-Solving: apply and transfer autonomously and collaboratively mathematical concepts and problem- solving

techniques to unfamiliar, varied and real-world situations
2. Reasoning: reason abstractly and quantitatively by applying mathematical representations, symbols and estimation techniques when engaging in problem-solving
3. Critical Thinking: construct and effectively communicate valid conclusions and critique the reasoning of others
4. Modeling: demonstrate mastery of concepts by evaluating models that others have constructed or by creating appropriate models of their own
5. Tools: identify the correct tools to solve problems, if applicable
6. Precision: determine an answer's appropriateness as a means of determining its validity, while using proper mathematical notation and units
7. Structure: use multiple representations, critical thinking skills, and prior knowledge to solve problems in new situations
8. Patterns: analyze data and recognize patterns in a variety of situations
9. Habits of Mind: approach new situations with curiosity, persistence, resourcefulness, and confidence; take risks, monitor their progress, accept and learn from setbacks, make adjustments, and reflect on their performance.

Enduring Understandings	*Essential Questions*
Students will understand that. . . *EU 1* the connections between symbolic and physical representations. *EU 2* geometric origins of conics will enhance their ability to analyze and manipulate conic equations in mathematical and real-world applications.	- Which method, geometric or algebraic, is more efficient to solve a problem? - How can conic sections be used to model real-world phenomena?
Knowledge *Students will know . . .* *EU 1* - the type of conic can be determined by the standard form of an equation.(G.GPE.A.1-3) - conics have distinct features.(G.GPE.A.1-3)	*Skills* *Students will be able to. . .* *EU 1* write conic equations in standard form and general form.(G.GPE.A.1-3)

EU 2 ● conics are used in architecture, art, and nature. (G.MG.A.1,3)	● translate conic equations from standard form to general form and vice versa.(G.GPE.A.1-3) ● identify the type of conic given the equation in standard form.(G.GPE.A.1-3) ● graph conics and identify key features.(G.GPE.A.1-3) *EU 2* ● identify examples of conic sections used in architecture, agriculture, art, astronomy, and various other real life situations. (G.MG.A.1,3) .

Stage Two - Assessment

Stage Three - Instruction

Learning Plan: **Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections: Each learning activity listed must be accompanied by a learning goal of A= Acquiring basic knowledge and skills, M= Making meaning and/or a T= Transfer.** *{place A, M and/or T along with the applicable EU number in parentheses after each statement} All knowledge and skills must be addressed in this section with a corresponding lesson/activity which teaches each concept. The following color codes are used to notate activities that correspond with interdisciplinary connections and 21st Century Life & Career Connections (which involves Technology Literacy):* *Red = Interdisciplinary Connection; Purple = 21st Century Life & Career Connection*

- Intro to Conics Activity (**A, EU 1**)
  Copy of CircleEquationAnimals.pdf

- In class Gallery Walk: Conics (**M, T, EU 2**)
  Copy of ActivityConicSections - Around the world.pdf

- Desmos Activity, Marbleslides: Conics **(M,T EU1)**
  https://teacher.desmos.com/activitybuilder/custom/5804ca491c82e98a0e89df07

- Desmos Project, Make a Picture **(M, T, EU1)**
  https://www.scarsdaleschools.k12.ny.us/cms/lib/NY01001205/Centricity/Domain/1251/Conic%20sections%20project%20204 3 3.pdf

  Suggested Sequence of Learning Activities
- Intro to Conics Activity, link above(**A, EU 1**)
- Graph & write equations of circles (**A, M, EU 1**)
- Graph & write equations of ellipses(**A, M, EU 1**)
- Graph & write equations of parabolas(**A, M, EU 1**)
- Graph & write equations of hyperbolas(**A,M, EU 1**)
- Gallery Walk Activity, linked above (**M, T, EU 2**)
- Desmos Activity, Marbleslides: Conics **(M,T EU 1)**
- Desmos Project, Make a Picture **(M, T, EU1)**
- Identify the conic by general form (T, EU 1)

Pacing Guide

Unit #	Title of Unit	Approximate # of teaching days
1	Conics	12
2	Trigonometry	56
3	Functions	57
4	Limits	10

Instructional Materials

TI-Nspire Calculator
DESMOS online graphing calculator and activities
Khan Academy
Kuta Infinite Software

Accommodations

Special Education: The curriculum will be modified as per the Individualized Education Plan (IEP). Students will be accommodated based on specific accommodations listed in the IEP.

Students with 504 Plans: Students will be accommodated based on specific accommodations listed in the 504 Plan.

English Language Learners: Students will be accommodated based on individual need and in consultation with the ELL teacher.

Students at Risk of School Failure: Students will be accommodated based on individual need and provided various structural supports through their school.

Gifted and Talented Students: Students will be challenged to enhance their knowledge and skills through acceleration and additional independent research on the subject matter.