



**Marietta City Schools**  
**2025–2026 District Unit Planner**

*Pre-Calculus*

<b>Unit title</b>	<i>Unit 4: Modeling with Conic Sections and Polar Equations</i>	<b>Unit duration (hours)</b>	<i>15-18.75</i>
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**Mastering Content and Skills through INQUIRY (Establishing the purpose of the Unit):** *What will students learn?*

**GA DoE Standards**

**Standards**

PC.GSR.5: Analyze the behaviors of conic sections and polar equations to model contextual mathematical problems.

- PC.GSR.5.1 Identify and graph different conic sections given the equations in standard form.
- PC.GSR.5.2 Identify different conic sections in general form and complete the square to convert the equation of a conic section into standard form.
- PC.GSR.5.3 Define polar coordinates and relate polar coordinates to Cartesian coordinates.
- PC.GSR.5.4 Classify special polar equations and apply to contextual situations.
- PC.GSR.5.5 Graph equations in the polar coordinate plane with and without the use of technology.

PC.MM.1: Apply mathematics to real-life situations; model real-life phenomena using mathematics.

- **PC.MM.1.1** Explain contextual, mathematical problems using a mathematical model.
- **PC.MM.1.2** Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts.
- **PC.MM.1.3** Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation.
- **PC.MM.1.4** Use various mathematical representations and structures with this information to represent and solve real-life problems.

**Concepts/Skills to be Mastered by Students**

Identify the four main types of conic sections (parabola, ellipse, circle, hyperbola)

Graph conic sections  
Write equations of conic sections  
Convert between general and standard form for equations of conic sections  
Identify polar coordinates  
Graph polar coordinates  
Convert between rectangular and polar forms  
Graph polar equations  
Identify and graph classical curves including roses, cardioids, and limacons.

### Essential Questions

1. How do we as mathematicians identify the key features (foci, vertices, directrices, center, axes) that define each conic section and distinguish it from others?
2. How do we as mathematicians translate between different representations of conic sections, such as general form equations, standard form equations, and their graphs?
3. How do we as mathematicians determine the most effective mathematical model (e.g., a parabola for a projectile, an ellipse for an orbit) to represent real-world situations?
4. Why should we as mathematicians use the polar coordinate plane? (What kind of shapes become simpler?)
5. How does converting equations from rectangular to polar benefit me as a mathematician?

### Assessment Tasks

*List of common formative and summative assessments.*

#### **Formative Assessment(s):**

Unit 4 Quiz, Skills Checks, Warm-ups

#### **Summative Assessment(s):**

Unit 4A and Unit 4B Assessment

### **Learning Experiences**

Add additional rows below as needed.

Objective or Content	Learning Experiences	Personalized Learning and Differentiation
<p>PC.GSR.5: Analyze the behaviors of conic sections and polar equations to model contextual mathematical problems.</p> <ul style="list-style-type: none"> <li>● PC.GSR.5.1 Identify and graph different conic sections given the equations in standard form.</li> <li>● PC.GSR.5.2 Identify different conic sections in general form and complete the square to convert the equation of a conic section into standard form.</li> </ul>	<p><a href="#">Conic House</a></p> <p>Explore Reflect</p> <ul style="list-style-type: none"> <li>● I can convert from general to standard form of the equation of a conic and produce the correct graph with its characteristics.</li> <li>● I can derive the equation of a parabola given a focus and directrix.</li> <li>● I can 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.</li> </ul>	<p><b>Supporting the Learning</b></p> <ul style="list-style-type: none"> <li>● Stations Review day on Conics</li> <li>● Connect to Prior knowledge from Geometry and Advanced Algebra and build.</li> <li>● Demonstrate how technology can be used as a resource.</li> </ul> <p><b>Extending the Learning:</b></p> <ul style="list-style-type: none"> <li>● Push students into contextual problems.</li> </ul> <p><b>Language Supports:</b></p> <ul style="list-style-type: none"> <li>● Provide multiple opportunities for structured peer interactions or conversations (pairs or triads) on whiteboards.</li> <li>● Allow students the opportunity to share and explain their reasoning.</li> </ul>
<b>Content Resources</b>		
<p><b>Pearson</b> <b>Math Medic</b></p>		