Math 3

Unit 2

Conics

Georgia Performance Standards
High School Mathematics
Mathematics III: Advanced Algebra/Statistics

Georgia Performance Standards: Curriculum Map

1st Semester			**2nd Semester**		
Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Modeling with Matrices	Conics	Logarithmic and Exponential Functions	Solving Equations and Inequalities	Polynomial Functions	Data Analysis
4 Weeks	7 Weeks	6 Weeks	5 Weeks	5 Weeks	4 Weeks
MM3A4	**MM3G1**	**MM3A2a,b,c,e,f,g**	**MM3A2d,g**	**MM3A1**	**MM3D1**
MM3A5	**MM3G2**		**MM3A3**	**MM3G3a,b**	**MM3D2**
MM3A6	**MM3G3c**				**MM3D3**
MM3A7					

Mathematics 3 – Unit 2: Conics

Introduction:

Conics sections are presented from both an algebraic and a geometric point of view. Students address equations in standard and general forms. Graphing is done by hand and using graphing technology. Parabolas have been studied in previous courses as quadratic functions, but in this unit they are addressed as a type of conic section and the two presentations are connected. Many of the applications of conic sections depend on their reflective properties.

Enduring understandings:

- Write and interpret the equation of a circle
- Solve systems of equations involving a circle and a line or two circles.
- Recognize, write, and interpret equations of conic sections.
- Recognize conic sections as useful in applications.
- Recognize and use planes and spheres.

Key Standards Addressed:

MM3G1. Students will investigate the relationships between lines and circles.
 a. Find equations of circles.
 b. Graph a circle given an equation in general form.
 c. Find the equation of a tangent line to a circle at a given point.
 d. Solve a system of equations involving a circle and a line.
 e. Solve a system of equations involving two circles.

MM3G2. Students will recognize, analyze, and graph the equations of the conic sections (parabolas, circles, ellipses, and hyperbolas).
 a. Convert equations of conics by completing the square.
 b. Graph conic sections, identifying fundamental characteristics.
 c. Write equations of conic sections given appropriate information.

MM3G3. Students will investigate planes and spheres.
   a. Plot the point (x, y, z) and understand it as a vertex of a rectangular prism.
   b. Apply the distance formula in 3-space.
   c. Recognize and understand equations of planes and spheres.

Related Standards Addresses:

MM3P1. Students will solve problems (using appropriate technology).
   a. Build new mathematical knowledge through problem solving.
   b. Solve problems that arise in mathematics and in other contexts.
   c. Apply and adapt a variety of appropriate strategies to solve problems.
   d. Monitor and reflect on the process of mathematical problem solving.

MM3P2. Students will reason and evaluate mathematical arguments.
   a. Recognize reasoning and proof as fundamental aspects of mathematics.
   b. Make and investigate mathematical conjectures.
   c. Develop and evaluate mathematical arguments and proofs.
   d. Select and use various types of reasoning and methods of proof.

MM3P3. Students will communicate mathematically.
   a. Organize and consolidate their mathematical thinking through communication.
   b. Communicate their mathematical thinking coherently and clearly to peers,
   teachers, and others.
   c. Analyze and evaluate the mathematical thinking and strategies of others.
   d. Use the language of mathematics to express mathematical ideas precisely.

MM3P4. Students will make connections among mathematical ideas and to other disciplines.
   a. Recognize and use connections among mathematical ideas.
   b. Understand how mathematical ideas interconnect and build on one
      another to
produce a coherent whole.
   c. Recognize and apply mathematics in contexts outside of
      mathematics.
MM3P5. Students will represent mathematics in multiple ways.
   a. Create and use representations to organize, record, and
      communicate
mathematical ideas.
   b. Select, apply, and translate among mathematical representations to
      solve
problems.
   c. Use representations to model and interpret physical, social, and
      mathematical
    phenomena.

Mathematics III Unit 2

Conic Sections

Concept Map

Unit Essential Question			Georgia Performance Standards	
How do I identify and apply the characteristics of the conic sections? How do I operate with figures in 3-space?			MM3G1 – Investigate the relationships between lines and circles. MM3G2 – Recognize, analyze, and graph the equations of conic sections (parabolas, circles, ellipses, and hyperbolas). MM3G3 – Investigate planes and spheres.	
Lesson 2.1 Equations of Circles How do I identify the characteristics of circles from equations? What characteristics of circles are necessary to graph and write the equations of circles? MM3G1 a.b.	**Lesson 2.2 Line/Circle Relationships** How do I find the equation of a line tangent to a circle? MM3G1 c.	**Lesson 2.3 Systems** What methods are used to determine the solutions of intersections of circles and lines and circles? MM3G1 d.e.	**Lesson 2.4 Characteristics of Conic Systems** How do I identify characteristics of parabolas graphically and algebraically centered on the origin? How do I identify characteristics of ellipses graphically and algebraically centered on the origin? How do I identify characteristics of hyperbolas graphically and algebraically centered on the origin? How do I identify characteristics of parabolas graphically and algebraically not centered on the origin? How do I identify characteristics of ellipses graphically and algebraically not centered on the origin? How do I identify characteristics of hyperbolas graphically and algebraically not centered on the origin? How are discriminants used to classify conic systems? MM3G3 b.c.	**Lesson 2.5 Planes and Spheres** How do I graph a point in 3-space? How do I determine the distance between two points in 3-space? What are the differences between the equations of a plane and sphere? MM3G3 a.b.c.

Unit 2 – Conic Sections (5 weeks)

Unit Essential Questions:
1. How do I identify and apply the characteristics of the conic sections?
2. How do I operate with figures in 3-space?

Lesson 1: Equations of Circles
Essential Questions:
1. How do I identify the characteristics of circles from equations?
2. What characteristics of circles are necessary to graph and write the equations of circles?

Lesson 2: Line/Circle Relationships
Essential Question:
1. How do I find the equation of a line tangent to a circle?

Lesson 3: Systems
Essential Question:
1. What methods are used to determine the solutions of intersections of circles and lines and circles?

Lesson 4: Characteristics of Conic Sections
Essential Questions:
1. How do I identify the characteristics of parabolas graphically and algebraically centered on the origin?
2. How do I identify the characteristics of ellipses graphically and algebraically centered on the origin?
3. How do I identify the characteristics of hyperbolas graphically and algebraically centered on the origin?
4. How do I identify the characteristics of parabolas graphically and algebraically not centered on the origin?
5. How do I identify the characteristics of ellipses graphically and algebraically not centered on the origin?
6. How do I identify the characteristics of hyperbolas graphically and algebraically not centered on the origin?
7. How are discriminants used to classify conic sections?

Lesson 5: Planes and Spheres
Essential Questions:
1. How do I graph a point in 3-space?
2. How do I determine the distance between two points in 3-space?
3. What are the differences between the equations of a plane and sphere?

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