**Algebra 3-4**

**Unit 10: Conic Sections**

In this chapter you will work with curves that you can trace along the surface of a cone. These curves are called conic sections.

People can manufacture these curves to make beautiful architecture.

Unit Overview

Conic Sections

Grade Level: Algebra 3-4, 2013

Designer(s): OPS Secondary Math Department

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| **Unit 10: Conic Sections** | | |
| **Enduring Understandings** | **Standard** | **Essential Questions**  F= Factual C=Conceptual D=Debatable |
| 1. A conic section is a curve obtained by intersecting a plane and a double napped cone. |  | * If a plane is parallel to the base of the cone what is the shape of the cross section? (F/Level 2) * How does the inclination of the plane change when forming parabolas and hyperbolas (C/Level 3) |
| 1. Each conic section has its own unique equation in both standard and general conic form. | MA  12.2.2.a | * What is the standard equation of a circle?(F/Level 2) * Which conic section is represented by the following equation ? (C/Level 3) * Write the equation of a circle that is centered at the origin and passes through the point (4,5). (C/Level 3) |
| 1. The signs of the equations and the coefficients of the variable terms determine the shape and the orientation of the conic section. | MA  12.2.2.a | * Are there any characteristics of equations of conic sections in general form that can help identify the conic section? Explain (F/Level 2) * Graph and state the domain and the range. (C/Level 3) * What is the line(s) of symmetry for ? (C/Level 3) |

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| *Knowledge Statements*  Students will know…   1. **Vocabulary:** conic section, parabola, ellipse, circle, hyperbola, axis of symmetry, focus, directrix, vertex, co-vertex, asymptote, major axis, minor axis, transverse axis, origin, radius, diameter. 2. Standard form equations 3. General form equations 4. Domain and Range 5. Distance Formula | *Key Skill Statements*    Students will know how to…   1. Write the equation of a conic section in standard form given general form, graph, or specific characteristics. 2. Graph a conic section. 3. Identify the axis of symmetry. 4. Identify conic sections given an equation. 5. State the domain and range. |

**Unit 10: Conics**

**Critical Content Skills:**

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| **Algebra 3-4**  **Chapter 10: Conic Sections** | | | |
| **Advanced**  **Score 4.0** | In addition to the Proficient (3.0) performance, makes ***indepth*** inferences and extended applications of what was learned, including connections to other experiences. | | • Solving real life problems involving conic sections.  • Solve a quadratic system.  • Graph a system of conic inequalities. |
|  | **Proficient +**  **Score 3.5** | In addition to the complex ideas and processes (Proficient 3.0) performance, ***partial success*** at in-depth inferences and extended applications of what was learned, including connections to other experiences. | |
| **Proficient**  **Score 3.0** | ***No major*** errors or omissions regarding any of the information and simple (Basic, 2.0) or complex processes (Proficient, 3.0) that was explicitly taught. | | • Write equations given specific characteristics of a conic section (Ex. Foci, vertices of an ellipse).  • State the domain and range of a conic section.  • Graph conic sections with a translated center.  • Write the equation of any conic section in standard form.  • Identify focus and directrix of a parabola.  • Identify the foci of an ellipse and hyperbola. |
|  | **Basic +**  **Score 2.5** | ***No major*** errors or omissions regarding any of the information and/or simpler details and processes (Basic, 2.0) and ***partial*** knowledge of the more complex ideas and processes (Proficient, 3.0) | |
| **Basic**  **Score 2.0** | ***No major*** errors or omissions regarding the simpler details and processes (Basic, 2.0), but ***major*** errors or omissions regarding the more complex ideas and processes (Proficient, 3.0). | | • Write the equation of a conic section given its graph.  • Write equations in standard form given the general form, centered at the origin.  • Identify the axis of symmetry.  • Graph conic sections centered at the origin.  • Identify the type of conic section given an equation.  • Find distance and midpoint. |
| **Below Basic**  **Score 1.0** | A ***partial*** understanding of ***some*** of the simpler details and processes (Basic, 2.0), but ***major*** errors or omissions regarding the more complex ideas and processes. | | |
| **Failing**  **Score 0** | ***No*** evidence or ***insufficient*** evidence of student learning. | | |

Algebra 3-4 Name

Pd Date

**For problems 1 – 5, identify the type of conic section from the equation. (L2)**

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| **Answer** | **Statement** | **Answer Bank** |
|  | 1.. | [**A**] Parabola  [**B**] Circle  [**C**] Ellipse  [**D**] Hyperbola |
|  | 2. |
|  | 3. |
|  | 4. |
|  | 5. |

6. For  with endpoints *P*(1, 7) and *Q*(9,–8), find  and the midpoint, *M*, of the segment. **(L2)**

|  |  |  |  |
| --- | --- | --- | --- |
| 7. Select the equation of the conic section graphed. **(L2)** | | 8. Select the equation of the conic section graphed. **(L2)** | |
| **[A]**  **[B]**  **[C]**  **[D]** | [image] | **[A]**  **[B]**  **[C]**  **[D]** | [image] |

**Graph the conic sections and state the domain and range.[L3]**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| [image]9.  **Domain**    **Range** |  |  | 10.  [image] | **Domain**    **Range** |
|  |  |  |  |

**For problems 11 – 14, write the standard equation of the conic section with the given characteristics. [L3]**

11. circle with diameter endpoints at (–8, 5) and (4, 21)

12. parabola with focus at (6, 8) and directrix at 

13. ellipse with center at (5, –7), a major axis of 16 and foci at

(–1, –7) and (11, –7)

14. hyperbola with foci at (2, 0) and (14, 0) and vertices at (12, 0) and

(4, 0)

**For problems 15 – 18 classify and write the standard equation of each conic section. [L3]**

15.  16. 

**Answers**

**17.**

**18.**

**19.**

**20.**

17.  18. 

19. A ride for an amusement park is being designed. The ride has two tracks that are hyperbolic. If the ride is placed on a coordinate grid, the vertices of the ride are at (–3, 2) and (5, 2) and the foci are at (–5, 2) and (7, 2). **[L4]**

a. Explain how to find the values of *a, b,* and *c* for the hyperbolic tracks and state their values.

b. Write an equation for the path of the tracks. Explain your method.

20. Find the points of intersection, if any of the graphs in the system. **[L4]**



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| **Learning Experiences** | **Text Pages/Resources** |
| **Vocabulary**   * Word wall * Foldable – See Glencoe @2010 Foldables by Dinah Zike for more information * Matching the word to the definition, graph, or example * Anticipation guide (pre and post) |  |
| * **Lessons Resources at the end of each section.** * **Online resources at pearsonsuccessnet.com** | Pearson Algebra 2  10.1  10.2  10.3  10.4  10.5  10.6 |
| **General:**  **Test-Taking Strategy**  Be sure to check the reasonableness of your answer. If students are asked for the balance of a bank account where you were dealing with amounts in the hundreds, it is not reasonable to give an answer in the millions. To make sure the answer to a problem is reasonable, you can estimate before you calculate. If the answer is close to your estimate, your answer is probably correct. |  |

**Teacher Notes/Additional Resources**

**General Algebra & Math sites:**

* AlgebraLAB: Making Math & Science Connections [www.algebralab.org](http://www.algebralab.org)
* Classzone from Holt McDougall’s free site includes really cool animations. You and your students will simply need to figure out which chapter in their book relates to what we’re studying. <http://www.classzone.com/cz/books/algebra_1_2011_na/book_home.htm?state=NE>
* Kuta software <http://www.kutasoftware.com> Excellent free worksheets (with answers) <http://www.kutasoftware.com/free.html>
* NCTM’s Figure This! Web site has several challenge problems that are designed for families to do together. <http://figurethis.org/download.htm> These challenges (there are 80 of them!) could be used for daily warm-ups in class (several involve estimation), weekly Problem-of-the-Week, and even a challenge problem along with their homework, if relevant.
* Math is Fun! Includes an illustrated math dictionary and helpful tutorials for students. [www.mathisfun.com](http://www.mathisfun.com)
* Daily Math Review <http://www.aea11.k12.ia.us/E2T2/dmr.html>
* Great online timer: <http://www.online-stopwatch.com>
* Porta Portal’s consolidated resource list <http://guest.portaportal.com/mrburke>
* Algebra2Go <http://www.saddleback.edu/faculty/lperez/algebra2go/index.html>
* About.com Education site has great warm ups <http://712educators.about.com/cs/warmups/l/blwarmmath.htm>
* Southern Regional Education Boards Instructional Resources <http://www.evalutech.sreb.org/InstResources/index.asp>

**Books:**

* Various resources provided by publishers for the book selection process

**Videos:**

* BrainPop [www.brainpop.com](http://www.brainpop.com)
* Teacher Tube [www.teachertube.com](http://www.teachertube.com)