

Pre-Calculus: Conics

Stage 1 Desired Results		
ESTABLISHED GOALS: <u>Competencies:</u> - Students will demonstrate application skills by using mathematical concepts and symbols to represent, analyze, and solve problems arising in everyday life, society, and the workplace. - Students will demonstrate resourcefulness by evaluating and selecting the most effective tools to solve mathematical problems and deepen their understanding of concepts. - Students will demonstrate structural awareness by discerning patterns and functional relationships within complex mathematical concepts to simplify and solve problems. - Students will demonstrate the ability to analyze and summarize text and integrate knowledge to make meaning of discipline-specific materials. - Students will demonstrate the ability to produce coherent and supported writing in order to communicate effectively for a range of discipline-specific tasks, purposes, and audiences. - Students will demonstrate the ability to speak purposefully and effectively by strategically making decisions about content, language use, and discourse style. <u>Content Standards:</u> - HSG.C.A.4 Construct a tangent line from a point outside a given circle to the circle. - HSG.GPE.A.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. - HSG.GPE.A.2 Derive the equation of a parabola given a focus and directrix. - HSG.GPE.A.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. - HSG.GMD.A.2 Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures. - MP2 Reason abstractly and quantitatively. - MP4 Model with mathematics. - MP5 Use appropriate tools strategically. - MP7 Look for and make use of structure. - MP8 Look for and express regularity in repeated reasoning.	Transfer	
	Students will be able to independently use their learning to apply their knowledge of conics to model and solve problems.	
	Meaning	
	ENDURING UNDERSTANDINGS Students will understand that... - a conic is the intersection of a plane and a double-napped cone. - a conic section can be classified based on its general equation.	ESSENTIAL QUESTIONS How can we use conics as a tool to better understand the world around us?
	Acquisition	
	Students will know... - the parametric equation for an ellipse. - the relationship between polar and rectangular coordinates. - the distance formula for polar coordinates. - the properties of polar equations for lines. - the formula for the angle of inclination. - the formula for the distance from a point to a line, both when the line is in slope-intercept and in standard form. - the basic equations for the parabola. - the standard form of the equation of an ellipse. - the reflection property of an ellipse. - the standard form of the equation of a hyperbola. - the formulas for the lengths of the focal radii of an ellipse. - the focus and focus-directrix properties of the hyperbola. - the Focus-Directrix Property of Conics. - the Polar Equations of the Conics. - Cavalieri's Principle. <u>vocabulary:</u> parametric equation, parameter, orientation, polar coordinates, polar axis, angle of inclination, parabola, directrix, focus, focal chord, focal	Students will be skilled at... - finding the coordinates of the corresponding point on the curve, given the parametric equation of a curve and a value for the parameter. - graphing parametric equations. - finding an x-y equation given parametric equations. - changing from polar to rectangular coordinates. - converting a polar equation to rectangular form and vice-versa. - finding the distance between points in polar coordinates. - finding the equation of a circle by completing the square. - finding the equation of a circle by translation. - determining the center and radius of a circle. - graphing a circle and its radius. - finding a polar equation for a circle. - graphing a line through the pole. - finding a polar equation for a tangent line to a circle. - calculating the angle of inclination. - finding the distance from a point to a line. - determining the equation of a line tangent to a circle. - finding the equation for a given parabola

	<i>width, paraboloid of revolution, focal length, focal ratio, ellipse, major axis, semimajor axis, minor axis, semiminor axis, eccentricity, tangent to an ellipse, focal radii, hyperbola, branches, focal axis, transverse axis, conjugate axis, focal radii, polar coordinates, rotation of axes</i>	• <i>analyzing the graph of a parabola to identify key characteristics.</i> • <i>performing transformations to the graph a parabola.</i> • <i>finding focal length and focal ratios.</i> • <i>analyzing and graphing an ellipse.</i> • <i>finding the equation for an ellipse.</i> • <i>determining the tangent to an ellipse.</i> • <i>sketching the asymptotes for a hyperbola.</i> • <i>analyzing and graphing a hyperbola.</i> • <i>computing the lengths of the focal radii of an ellipse</i> • <i>finding lengths of focal radii of an ellipse.</i> • <i>determining the foci, eccentricity, and directrices for ellipses and hyperbolas.</i> • <i>determining the polar equation for a parabola.</i> • <i>graphing ellipses, hyperbolas in polar coordinates .</i> • <i>finding x-y coordinates from x'-y' coordinates.</i> • <i>transforming and x-y equation to x'-y'- coordinates.</i> • <i>create an informal argument using Cavalieri's Principle for the formulas for the volume of a sphere and other solid figures.</i>
Content Area Literacy Standards		21st Century Skills
• RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. • RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to <i>grades 11-12 texts and topics</i>. • RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. • RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.		• <i>reason effectively</i> • <i>use systems thinking</i> • <i>make judgments and decisions</i> • <i>solve problems</i> • <i>assess and evaluate information</i> • <i>use and manage information</i> • <i>access technology effectively</i>

Stage 2 - Evidence	
<i>Evaluative Criteria</i>	<i>Assessment Evidence</i>
	PERFORMANCE TASK(S):
	OTHER EVIDENCE:

Stage 3 – Learning Plan	
Summary of Key Learning Events and Instruction	
<i>Language Arts Integration</i>	<i>Mathematics Integration</i>
1.OA.1 Use	1.OA.1 Use
<i>Technology Integration</i>	<i>District Materials</i>
1.OA.1 Use	