Mathematics
Precalculus: B
Unit 3: Polar Coordinates and Complex Numbers

Essential Understandings	▪ Mathematics can be used to model real-life situations.
Essential Questions	▪ What are the properties of Algebra and how are these used to solve polar equations? ▪ What types of data are modeled by polar and complex equations? ▪ What are the properties of polar and complex numbers? ▪ How are polar coordinates calculated and what does it represent?
Essential Knowledge	▪ Polar coordinates and complex numbers can be graphed. ▪ Rectangular coordinates can be converted to polar, and visa versa. ▪ The relationship between different functions and their graphs can be studied. ▪ Multiplication or division of a complex number can be found using the same procedures used when multiplying polynomials. ▪ The complex number a +bi, where a and b are real numbers is said to be in rectangular form.
Vocabulary	▪ <u>Terms</u>: ○ complex number, complex conjugates, imaginary number, polar axis and coordinates, polar graph and plane, modulus, absolute value of a complex number, iteration, rectangular form of a complex number, trigonometric form of a complex number
Essential Skills	▪ Graph points in polar coordinates ▪ Convert between polar and rectangular coordinates ▪ Write and graph the polar form of a linear equation. ▪ Graph complex numbers in the complex plane. ▪ Find powers and roots of complex numbers in polar form using De Moivre's theorem.
Related Maine Learning Results	<u>Mathematics</u> A. Number Real Number A1. Students will know how to represent and use real numbers. a. Use the concept of nth root. b. Estimate the value(s) of roots and use technology to approximate them. c. Compute using laws of exponents. d. Multiply and divide numbers expressed in scientific notation. e. Understand that some quadratic equations do not have real solutions and that there exist other number systems to allow for solutions to these equations.

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Related Maine Learning Results	B. Data Data Analysis B2. Students understand correlation and cause and effect. a. Recognize when correlation has been confused with cause and effect. b. Create and interpret scatter plots and estimate correlation and lines of best fit. c. Recognize positive and negative correlations based on data from a table or scatter plot. d. Estimate the strength of correlation based upon a scatter plot. B3. Students understand and know how to describe distributions and find and use descriptive statistics for a set of data. a. Find and apply range, quartiles, mean absolute deviation, and standard deviation (using technology) of a set of data. b. Interpret, give examples of, and describe key differences among different types of distributions: uniform, normal, and skewed. c. For the sample mean of normal distributions, use the standard deviation for a group of observations to establish 90%, 95%, or 99% confidence intervals. B4. Students understand that the purpose of random sampling is to reduce bias when creating a representative sample for a set of data. a. Describe and account for the difference between sample statistics and statistics describing the distribution of the entire population. b. Recognize that sample statistics produce estimates for the distribution of an entire population and recognize that larger sample sizes will produce more reliable estimates. c. Apply methods of creating random samples and recognize possible sources of bias in samples.

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Related Maine Learning Results	D. Algebra Functions and Relations D4. Students understand and interpret the characteristics of functions using graphs, tables, and algebraic techniques. a. Recognize the graphs and sketch graphs of the basic functions. b. Apply functions from these families to problem situations. c. Use concepts such as domain, range, zeros, intercepts, and maximum and minimum values. d. Use the concepts of average rate of change (table of values) and increasing and decreasing over intervals, and use these characteristics to compare functions. D5. Students express relationships recursively and use iterative methods to solve problems. a. Express the (n+1)st term in terms of the nth term and describe relationships in terms of starting point and rule followed to transform one terms to the next. b. Use technology to perform repeated calculations to develop solutions to real life problems involving linear, exponential, and other patterns of change.
Sample Lessons And Activities	▪ Have students work cooperatively in groups, using their calculators to make a table of values for the equation r = sin x. Have them plot the ordered pairs on the polar plane, and describe the graph. ▪ Find the rectangular coordinates of each point with the given polar coordinates.
Sample Classroom Assessment Methods	▪ Evaluate homework. ▪ Quizzes. ▪ Chapter test.
Sample Resources	▪ Publications: o Glencoe Advanced Mathematical Concepts ▪ Other: o Graphing calculators. o The A+ learning system for remediation.