Mathematics
Precalculus: Honors
Unit 5: Vectors

Essential Understandings	▪ Vectors can be used to represent directed line segments. ▪ Vectors can be represented graphically. ▪ Vectors can be represented as complex numbers. ▪ Vectors can be used to model and solve real-life problems.
Essential Questions	▪ What is a vector? ▪ How can we resolve vectors graphically? ▪ How can we resolve vectors algebraically? ▪ How can vectors be used in navigation? ▪ How can we use vectors to find the work done by a force>
Essential Knowledge	▪ Vectors have an initial and terminal point. ▪ Vectors can be multiplied by a scalar. ▪ Vectors can be added. ▪ Vectors can be assigned a complex number. ▪ The trig form of a complex number = r(cos(theta) + isin(theta)).
Vocabulary	▪ <u>Terms</u>: ○ vector, directed line segment, standard position, magnitude, parallelogram law, scalar, resultant, trig form, modulus, argument
Essential Skills	▪ Add and subtract vectors graphically and algebraically. ▪ Find the resultant of two vectors. ▪ Find the angle between two vectors. ▪ Apply the parallelogram law for vector addition. ▪ Use vectors to find speed and direction.
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 Measurement and Approximation B1. Students understand the relationship between precision and accuracy. a. Express answers to a reasonable degree of precision in the context of a given problem. b. Represent an approximate measurement using appropriate numbers of significant figures. c. Know that most measurements are approximations and explain why it is useful to take the mean of repeated measurements. . Geometry Geometric Figures C1. Students justify statements about polygons and solve problems. a. Use the properties of triangles to prove theorems about figures and relationships among figures. b. Solve for missing dimensions based on congruence and similarity. c. Use the Pythagorean Theorem in situations where right triangles are created by adding segments to figures. d. Use the distance formula. C2. Students justify statements about circles and solve problems. a. Use the concepts of central and inscribed angles to solve problems and justify statements. b. Use relationships among arc length and circumference, and areas of circles and sectors to solve problems and justify statements. C3. Students understand and use basic ideas of trigonometry. a. Identify and find the value of trigonometric ratios for angles in right triangles. b. Use trigonometry to solve for missing lengths in right triangles. c. Use inverse trigonometric functions to find missing angles in right triangles. Geometric Measurement C4. Students find the surface area and volume of three-dimensional objects. a. Find the volume and surface area of three-dimensional figures including cones and spheres. b. Determine the effect of changes in linear dimensions on the volume and surface areas of similar and other three-dimensional figures.

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Related Maine Learning Results	D. Algebra Symbols and Expressions D1. Students understand and use polynomials and expressions with rational exponents. a. Simplify expressions including those with rational numbers. b. Add, subtract, and multiply polynomials. c. Factor the common term out of polynomial expressions. d. Divide polynomials by (ax+b). Equations and Inequalities D2. Students solve families of equations and inequalities. a. Solve systems of linear equations and inequalities in two unknowns and interpret their graphs. b. Solve quadratic equations graphically, by factoring in cases where factoring is efficient, and by applying the quadratic formula. c. Solve simple rational equations. d. Solve absolute value equations and inequalities and interpret the results. e. Apply the understanding that the solution(s) to equations of the form f(x) = g(x) are x-value(s) of the point(s) of intersection of the graphs of f(x) and g(x) and common outputs in table of values. f. Explain why the coordinates of the point of intersection of the lines represented by a system of equations is its solution and apply this understanding to solving problems. D3. Students understand and apply ideas of logarithms. a. Use and interpret logarithmic scales. b. Solve equations in the form of $x + b^y$ using the equivalent form $y = \log_b x$. 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.

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Related Maine Learning Results	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	▪ Students will sketch vectors on a complex coordinate graph. ▪ Students will add and subtract vectors algebraically and graphically. ▪ Students will write vectors in trigonometric form. ▪ Students will add, subtract, multiply, and divide vectors in trig form. ▪ Students will use trig form to find nth roots of complex numbers.
Sample Classroom Assessment Methods	▪ Homework ▪ Quizzes ▪ Chapter test
Sample Resources	▪ Publications: o Precalculus with Limits – A Graphing Approach ▪ Other Resources: o Graphing calculator o A+ learning system for remediation