Math 241S: Trigonometry with Vectors with Support

Course Content and Objective

COURSE CONTENT AND SCOPE – **Lecture:** Outline the topics included in the lecture portion of the course *(Outline reflects course description, all topics covered in class).*	Hours Per Topic	COURSE OBJECTIVES – **Lecture:** Upon successful completion of this course, the student will be able to…*(Use action verbs – see Bloom's Taxonomy for 'action verbs requiring cognitive outcomes.')*
Trigonometric functions of real numbers, the unit circle, trigonometric functions of real numbers, trigonometric graphs, and modeling harmonic motion.	16	Define the unit circle, Locate points on the unit circle, Locate terminal points on the unit circle, Define the reference number, Use reference numbers to find terminal points. Define the trigonometric functions. Evaluate trigonometric functions. Find the domains and signs of the trigonometric functions. Use a calculator to evaluate trigonometric functions. Define even and odd functions. Define the reciprocal and Pythagorean identities. Find all trigonometric functions from the value of one. Write one trigonometric function in terms of another. Graph the sine and cosine functions. Explain the periodic properties of sine and cosine. Graph transformations of the sine and cosine. Define amplitude and period. Graph shifted sine and cosine curves. Graph the tangent, cotangent, secant and cosecant functions and explain their periodic properties. Explain simple harmonic motion (SHM). Give the amplitude, period, and frequency of SHM, model various SHMs, and explain damped SHM.
Trigonometric functions of angles, angle measure, trigonometry of right triangles, trigonometric functions of angles, the Law of Sines, and the Law of Cosines.	16	Define angle measure, degree, radian. Give the relationship between degrees and radians. Convert degrees to radians. Convert radians to degrees. Draw an angle in standard position. Determine coterminal angles. Calculate the length of a circular arc. Calculate the area of a circular sector. Calculate the linear speed and angular speed of a point moving along a circle. Discuss the relationship between linear and angular speed. Find the trigonometric ratios of a right triangle. Determine the trigonometric ratios of special angles. Solve for the angle in a right triangle. Define the trigonometric functions of angles. Evaluate trigonometric functions at any angle. Find the signs of trigonometric functions, Find the reference angle. Use the reference angle to evaluate trigonometric functions. Express the fundamental identities. Determine the area of a triangle from two sides and the included angle. Use the Law of Sines to solve right triangles including the Angle-Side-Angle (ASA), Side-Angle-Angle (SAA), and Side-Side-Angle (SSA) cases. Use the Law of Cosines to solve right triangles in the SAS and Side-Side-Side (SSS) cases. Determine headings and bearing in navigation. Apply Heron's formula to find the area of a triangle.
Analytic trigonometry, trigonometric identities, addition and subtraction formulas, double-angle, half-angle, and sum-product formulas, inverse trigonometric functions, and trigonometric equations.	20	List the basic trigonometric identities: Reciprocal, Pythagorean, and even-odd, cofunctions. Simplify trigonometric expressions. Prove trigonometric identities. Apply the addition and subtraction formulas for sine, cosine, and tangent. Form expressions of the form $A \sin x + B \cos x$. Apply the double-angle, half-angle, and product-sum formulas. Define the inverse trigonometric functions, evaluate the inverse trigonometric functions. Solve trigonometric equations.
Polar coordinates and vectors, polar coordinates, graphs of polar equations, polar form of complex numbers, DeMoivre's theorem, vectors, and the dot product theorem.	18	Define polar coordinates, the polar coordinate system, the pole and the polar axis. Define the relationship between polar and rectangular coordinates. Convert from polar to rectangular and vice-versa. Solve polar equations. Graph polar equations. Test for symmetry. Graph complex numbers. Calculate the modulus. Determine the polar form of complex numbers. Add, subtract, multiply, and divide complex numbers. Write down DeMoivre's

		theorem. Use DeMoivre's theorem to find the nth roots of a complex number. Define vectors, initial point, terminal point, magnitude, displacement, sum and difference of vectors. Calculate the horizontal and vertical components of a vector. Write down the component form of a vector. List the algebraic, vector addition, and scalar multiplication properties of vectors. Write a vector in terms of I and j. Use vectors to model velocity and force. Calculate the resultant force of two or more vectors. Define the dot product of two vectors. Write down the dot product theorem. Calculate the angle between two vectors. Determine whether or not two vectors are orthogonal. Calculate the component of vector u along vector v. Resolve a force into components. Project a vector u onto a vector v. Calculate the work down by a force F along a vector D.
Final examination.	2	Final examination.
Total:	72	
Total Lecture Hours In Section I Class Hours:	72	

*Total lecture and laboratory hours (which include the final examination) must equal totals on page 1.
**In general "activity" courses or portions of courses are classified "laboratory."

Lab

COURSE CONTENT AND SCOPE - **Lab:** Outline the topics included in the lecture portion of the course *(Outline reflects course description, all topics covered in class).*	Hours Per Topic	COURSE OBJECTIVES – **Lab:** Upon successful completion of this course, the student will be able to…*(Use action verbs – see Bloom's Taxonomy for 'action verbs requiring cognitive outcomes.')*
Basic plane geometry.	3	Congruent, complementary and supplementary angles. Parallel and perpendicular lines. Understand the measurement relationship between angles formed by a transversal line that intersects two parallel lines, including vertical angles, alternate interior angles, alternate exterior angles, and corresponding angles. The Pythagorean Theorem and special right triangles.
Operations with radical expressions.	2	Multiply and divide radical expressions. Use the product rule to simplify radical expressions. Add or subtract like radicals. Use the distributive property in expressions containing radicals. Simplify radical expressions that contain mixed operations. Rationalize denominators. Rationalize denominators that have a sum or difference with a square root term. Rationalize numerators.
Factoring polynomials.	4	Write a polynomial as a product of a monomial greatest common factor (GCF) and a polynomial. Factor by grouping. Factor trinomials of the form $x^2 + bx + c$. Factor trinomials of the form $ax^2 + bx + c$, where a is not equal to 1. Factor special products and higher-order polynomials.
Solving quadratic equations by applying an appropriate method.	1	Solve quadratic equations by using the square root principle, by factoring, or by using the quadratic formula.
Review of functions.	6	Identify the domain and range of a relation and determine if the relation is a function. Identify functions and their domain and range. Evaluate a function at a given value. Find the composition of two functions. Show that two functions are inverses. Show that a function is one-to-one by using an appropriate method. Restrict the domain of a function to make it one-to-one. Find the inverse of a one-to-one function. Graph a given function's inverse function.
Review of complex numbers.	2	Perform arithmetic operations with complex numbers. Rationalize a denominator that is a complex number. Write a complex number in standard a+bi form. Simplify an expression that contains a power of i.
Total:	18	
Total Lab Hours In Section I Class Hours:	18	