

Course Syllabus

TRIGINOMETRY AND FUNTIONS (Math 115)

- Description:** *Topics will include trigonometry in the plane, trigonometric functions, simple vector geometry, functional concepts and notation, and an introduction to parametric equations and polar coordinates. Coursework is distributed both in-class and on-line. This course may not be used to fulfill the General Education Requirement in the College of Arts and Sciences nor be counted toward a major or minor in mathematics. Prerequisite: Grade of C- or higher in MATH 111, or placement higher than MATH 111 in the Math Placement process.*
- Credit Hours:** 2, meets in first and second seven week terms.
- Audience:** Taken by students on track for Calculus I or other STEM course requiring background in trigonometry and vector geometry.
- Prerequisites:** Grade of C- or higher in Math 111 or placement higher than Math 111 in the Math Placement process. A grade of C- or higher is required in this class for progress to Math 131: Calculus I.
- Format:** 200 minutes in class per week plus out of class work on-line. The course is available in each of the Fall and Spring semesters, and Summer offerings may be available when there is sufficient demand.
- Text Materials:** ALEKS Access Code (18 weeks) for *College Algebra and Trigonometry, 1st Ed*, by Miller and Gerkin (McGraw Hill, ISBN 9781259739323. This on-line platform will be used throughout. Students are encouraged to bring their own devices (tablets, laptops) to class; a small number of extras will be available during class periods.
- Internet:** Blackboard may be used by course instructors.
- Ability-Related Support:** The Access & Accommodations Resource Center (AARC) is the campus office that works with students to provide access and accommodations in cases of diagnosed mental or emotional health issues, attentional or learning disabilities, vision or hearing limitations, chronic diseases, or allergies. You can contact the office at aarc@valpo.edu or 219.464.5206. Students who need, or think they may need, accommodations due to a diagnosis, or who think they have a diagnosis, are invited to contact AARC to arrange a confidential discussion with the AARC office. Further, students who are registered with AARC are required to contact their professor(s) if they wish to exercise the accommodations outlined in their letter from the AARC.
- Notice of Cancellation:** In the event class is cancelled, you will be notified through your Valparaiso University e-mail account.

Student Learning Objectives:

Students will:

- A. Demonstrate mastery of fundamental topics in the area of trigonometry and its applications, particularly those needed for success in Calculus and other disciplines which rely on trigonometric principles.
- B. Demonstrate ability to use the language of functions and their notation at a level sufficient for success in Calculus.
- C. Demonstrate college-ready skills in organization, use of mathematical notation, and mathematical communication, as well as peer-to-peer communication.

Topics Include:

See attached detailed (representative) syllabus from ALEKS 360.

ALEKS[®] Course Syllabus

Course Name: MATH 115 F1EV: Trigonometry and Functions - TR 06:30 - 08:30pm	Course Code: KMMN3-KLHLX
ALEKS Course: College Algebra with Trigonometry	Instructor: Luther
Course Dates: Begin: 08/14/2017 End: 12/18/2017	Course Content: 148 topics / 91 accessible topics
Textbook: Miller: College Algebra & Trigonometry, 1st Ed. (McGraw-Hill) - ALEKS 360	

 Accessible Topic - Topics accessible to visually impaired students using a screen reader.

Course Readiness and Chapter R - Review of Prerequisites (27 topics, no due date)

Section R.2 (3 topics)

- Product rule with positive exponents: Univariate 
- Power rules with positive exponents: Multivariate products 
- Simplifying a ratio of multivariate monomials: Advanced 

Section R.3 (2 topics)

- Square root multiplication: Basic 
- Square root of a rational perfect square 

Section R.4 (7 topics)

- Simplifying a sum or difference of two univariate polynomials 
- Multiplying a univariate polynomial by a monomial with a positive coefficient 
- Multiplying binomials with leading coefficients greater than 1 
- Multiplying binomials in two variables 
- Multiplying conjugate binomials: Univariate 
- Squaring a binomial: Univariate 
- Multiplying binomials with negative coefficients 

Section R.5 (7 topics)

- Factoring a linear binomial 
- Factoring out a monomial from a polynomial: Univariate 
- Factoring a quadratic with leading coefficient 1 
- Factoring out a constant before factoring a quadratic 
- Factoring a quadratic with leading coefficient greater than 1: Problem type 1 
- Factoring a quadratic with a negative leading coefficient 
- Factoring a difference of squares in one variable: Basic 

Section R.6 (8 topics)

- Restriction on a variable in a denominator: Linear 
- Simplifying a ratio of factored polynomials: Linear factors 
- Simplifying a ratio of polynomials using GCF factoring 
- Simplifying a ratio of polynomials by factoring a quadratic with leading coefficient 1 
- Multiplying rational expressions made up of linear expressions 
- Finding the LCD of rational expressions with linear denominators: Relatively prime 
- Finding the LCD of rational expressions with linear denominators: Common factors 
- Complex fraction without variables: Problem type 1 

Chapter 1 - Equations and Inequalities (7 topics, no due date)

Section 1.3 (6 topics)

- Using i to rewrite square roots of negative numbers 

- Simplifying a product and quotient involving square roots of negative numbers [↗](#)
- Adding or subtracting complex numbers [↗](#)
- Multiplying complex numbers [↗](#)
- Dividing complex numbers [↗](#)
- Simplifying a power of i [↗](#)

Chapter 1 Supplementary Topics (1 topic)

- Evaluating a linear expression: Signed fraction multiplication with addition or subtraction [↗](#)

Chapter 2 - Functions and Relations (10 topics, no due date)

Section 2.7 (7 topics)

- Evaluating a piecewise-defined function [↗](#)
- Finding where a function is increasing, decreasing, or constant given the graph
- Finding where a function is increasing, decreasing, or constant given the graph: Interval notation
- Finding local maxima and minima of a function given the graph
- Even and odd functions: Problem type 1
- Graphing a piecewise-defined function: Problem type 2
- Determining if graphs have symmetry with respect to the x-axis, y-axis, or origin

Section 2.8 (3 topics)

- Sum, difference, and product of two functions [↗](#)
- Quotient of two functions: Basic [↗](#)
- Composition of two functions: Basic [↗](#)

Chapter 4 - Exponential and Logarithmic Functions (4 topics, no due date)

Section 4.1 (4 topics)

- Horizontal line test
- Determining whether two functions are inverses of each other [↗](#)
- Inverse functions: Rational [↗](#)
- Inverse functions: Cubic, cube root [↗](#)

Chapter 5 - Trigonometric Functions (28 topics, no due date)

Section 5.1 (5 topics)

- Converting degrees-minutes-seconds to decimal degrees
- Converting a decimal degree to degrees-minutes-seconds
- Converting between degree and radian measure: Problem type 1 [↗](#)
- Coterminal angles [↗](#)
- Arc length and central angle measure [↗](#)

Section 5.2 (4 topics)

- Using the Pythagorean Theorem to find a trigonometric ratio [↗](#)
- Finding trigonometric ratios given a right triangle [↗](#)
- Using cofunction identities [↗](#)
- Using a trigonometric ratio to find a side length in a right triangle [↗](#)

Section 5.3 (4 topics)

- Finding values of trigonometric functions given information about an angle: Problem type 1 [↗](#)
- Determining the location of a terminal point given the signs of trigonometric values [↗](#)
- Reference angles: Problem type 1 [↗](#)
- Finding values of trigonometric functions given information about an angle: Problem type 2 [↗](#)

Section 5.4 (3 topics)

- Trigonometric functions and special angles: Problem type 1 [↗](#)
- Even and odd properties of trigonometric functions [↗](#)
- Evaluating expressions involving sine and cosine

Section 5.5 (6 topics)

- Sketching the graph of $y = a \sin(x)$ or $y = a \cos(x)$
- Writing the equation of a sine or cosine function given its graph: Problem type 1

- Amplitude, period, and phase shift of sine and cosine functions [↗](#)
- Sketching the graph of $y = a \sin(x+c)$ or $y = a \cos(x+c)$
- Sketching the graph of $y = a \sin(bx)$ or $y = a \cos(bx)$
- Sketching the graph of $y = a \sin(bx+c)$ or $y = a \cos(bx+c)$

Section 5.6 (2 topics)

- Sketching the graph of a secant or cosecant function: Problem type 1
- Sketching the graph of a tangent or cotangent function: Problem type 1

Section 5.7 (4 topics)

- Values of inverse trigonometric functions [↗](#)
- Composition of a trigonometric function with its inverse trigonometric function: Problem type 1 [↗](#)
- Composition of a trigonometric function with the inverse of another trigonometric function: Problem type 1
- Composition of trigonometric functions with variable expressions as inputs: Problem type 1 [↗](#)

Chapter 6 - Analytic Trigonometry (20 topics, no due date)

Section 6.1 (2 topics)

- Simplifying trigonometric expressions [↗](#)
- Verifying a trigonometric identity

Section 6.2 (3 topics)

- Sum and difference identities: Problem type 1 [↗](#)
- Sum and difference identities: Problem type 3
- Evaluating a linear expression: Signed fraction multiplication with addition or subtraction [↗](#)

Section 6.3 (4 topics)

- Double-angle identities: Problem type 1 [↗](#)
- Power-reducing identities [↗](#)
- Half-angle identities: Problem type 1 [↗](#)
- Double-angle identities: Problem type 2 [↗](#)

Section 6.5 (11 topics)

- Finding solutions in an interval for a basic equation involving sine or cosine [↗](#)
- Finding solutions in an interval for a basic tangent, cotangent, secant, or cosecant equation [↗](#)
- Finding solutions in an interval for a trigonometric equation in factored form [↗](#)
- Finding solutions in an interval for a trigonometric equation with a squared function: Problem type 1 [↗](#)
- Finding solutions in an interval for a trigonometric equation using Pythagorean identities: Problem type 1 [↗](#)
- Finding solutions in an interval for an equation with sine and cosine using double-angle identities [↗](#)
- Solving a trigonometric equation modeling a real-world situation
- Solving a trigonometric equation involving an angle multiplied by a constant
- Finding solutions in an interval for a trigonometric equation with an angle multiplied by a constant [↗](#)
- Solving a basic trigonometric equation involving sine or cosine [↗](#)
- Solving a basic trigonometric equation involving tangent, cotangent, secant, or cosecant [↗](#)

Chapter 7 - Applications of Trigonometric Functions (13 topics, no due date)

Section 7.1 (5 topics)

- Solving a right triangle [↗](#)
- Using trigonometry to find a length in a word problem with two right triangles
- Using a trigonometric ratio to find an angle measure in a right triangle [↗](#)
- Using a trigonometric ratio to find a side length in a right triangle [↗](#)
- Using trigonometry to find angles of elevation or depression in a word problem

Section 7.2 (3 topics)

- Solving a triangle with the law of sines: Problem type 1 [↗](#)
- Solving a triangle with the law of sines: Problem type 2
- Solving a word problem using the law of sines

Section 7.3 (5 topics)

- Solving a triangle with the law of cosines [↗](#)
- Solving a word problem using the law of cosines

- Heron's formula [?](#)
- Finding the area of a triangle using trigonometry
- Using trigonometry to find the area of a right triangle

Chapter 8 - Trigonometry Applied to Polar Coordinate Systems and Vectors (40 topics, no due date)

Section 8.1 (7 topics)

- Plotting points in polar coordinates
- Multiple representations of polar coordinates
- Converting rectangular coordinates to polar coordinates: Special angles
- Converting polar coordinates to rectangular coordinates
- Converting an equation written in rectangular form to one written in polar form [?](#)
- Converting an equation written in polar form to one written in rectangular form: Problem type 1 [?](#)
- Converting an equation written in polar form to one written in rectangular form: Problem type 2 [?](#)

Section 8.2 (5 topics)

- Graphing a polar equation: Basic
- Graphing a polar equation: Circle
- Graphing a polar equation: Limacon
- Graphing a polar equation: Rose
- Graphing a polar equation: Lemniscate

Section 8.3 (8 topics)

- Plotting complex numbers
- Writing a complex number in standard form given its trigonometric form
- Writing a complex number in trigonometric form: Special angles
- Multiplying and dividing complex numbers in trigonometric form [?](#)
- De Moivre's Theorem: Answers in trigonometric form [?](#)
- De Moivre's Theorem: Answers in standard form
- Finding the nth roots of a number: Problem type 1
- Finding the nth roots of a number: Problem type 2

Section 8.4 (20 topics)

- Writing a vector in component form given its initial and terminal points [?](#)
- Writing a vector in $ai+bj$ form given its initial and terminal points [?](#)
- Magnitude of a vector given in $ai+bj$ form [?](#)
- Multiplication of a vector by a scalar: Geometric approach
- Vector addition and scalar multiplication: Component form [?](#)
- Vector addition and scalar multiplication: $ai+bj$ form [?](#)
- Linear combination of vectors: Component form [?](#)
- Linear combination of vectors: $ai+bj$ form [?](#)
- Vector addition: Geometric approach
- Vector subtraction: Geometric approach
- Finding the direction angle of a vector given in $ai+bj$ form
- Writing a vector to represent a force pushing or pulling an object
- Writing a vector given its magnitude and direction angle
- Finding magnitudes of forces related to an object suspended by cables
- Magnitude of a vector given in component form [?](#)
- Finding the magnitude and direction of a vector given its graph
- Finding the components of a vector given its graph
- Finding magnitudes of forces related to a sum of three vectors
- Unit vectors
- Writing a position vector in $ai+bj$ form given its graph

Chapter 11 - Analytic Geometry (1 topic, no due date)

Section 11.6 (1 topic)

- Writing the equation of a circle or ellipse and sketching its graph given its parametric equations