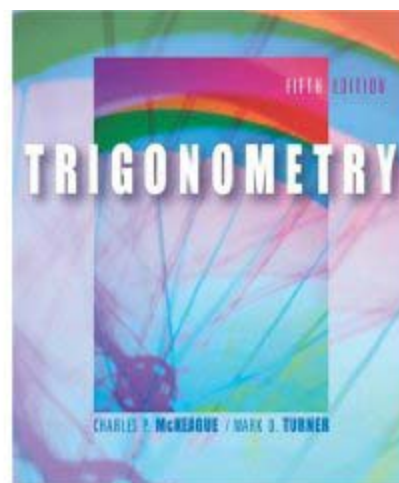


# Trigonometry - Text

## Course Description

This course provides a thorough grounding in the discipline's fundamentals, including right triangle trigonometry, the six trigonometric functions, radian measure, graphing and inverse functions, identities, equations, complex numbers, polar coordinates, and logarithms. Our text book includes a CD featuring the work's author, standing at a whiteboard and solving example problems.



# Syllabus Sample

Trigonometry

**Week 18**

**Section 4.6**

## ***Objectives***

In Week 18 you will:

- Read and complete the problems for section 4.6
- Review the definition of a function and its inverse
- Learn the inverse function notation
- Learn about the inverse sine relation, the inverse sine function, the inverse cosine function, and the inverse tangent function
- Learn how to graph the inverse trigonometric functions using a calculator

## ***Section 4.6***

- Read Section 4.6, “Inverse Trigonometric Functions”
- Go to section 4.6 of the Digital video companion. Take a quick look at the Problems Worked section, and then watch the Video Lesson. Which concepts from the reading does McKeague reinforce?
- Complete, “Problem Set 4.6” (odd numbers)

## ***Chapter 4 Group Project***

- Read the chapter 4 group project, “Modeling the Sunspot Cycle”
- Complete questions 1, 2, 5



***Take Chapter 4 Test located at the end of this syllabus.***

***Remember:*** Answer on separate paper, showing your work. You may want to use the Chapter Review and Chapter Test from your text to review.

**Send your completed and corrected work from lessons 17 and 18 to your teacher.**

# Outline for World Literature

## Lesson 1: Angles, Degrees, and Special Triangles

- Review angles in general
- Look into the terminology associated with angles
- Learn about the Pythagorean Theorem
- Learn what the  $30^\circ$ - $60^\circ$ - $90^\circ$  triangle is and why it is important
- Learn what the  $45^\circ$ - $45^\circ$ - $90^\circ$  triangle is and why it is important

## Lesson 2: The Rectangular Coordinate System

- Learn about the history of the rectangular coordinate system
- Learn how to graph lines, parabolas, and circles
- Be shown how to use your graphing calculator
- Learn the “distance formula”
- Learn the terms: standard position, quadrantal angle, and coterminal angles

## Lesson 3: Definition I: Trigonometric Functions

- Learn the six trigonometric functions
- Learn the algebraic signs of trigonometric functions

## Lesson 4: Introduction to Identities

- Review some concepts from arithmetic and algebra
- Learn about reciprocal, ration, Pythagorean, and identities

## Lesson 5: More on Identities

- Review the eight basic identities from the previous chapter
- Be able to use the identities to rewrite or simplify expressions

## Lesson 6: Definition II: Right Triangle Trigonometry

- Define the trigonometric functions as the ratios of sides in right angles
- See how definition two compares to definition one
- Learn the “cofunction theorem”
- Learn how to use a calculator to find approximations for trigonometric functions of angles between  $0^\circ$  and  $90^\circ$
- Learn about decimal degrees
- Learn about trigonometric functions and acute angles

## Lesson 7: Solving Right Triangles

- Learn about *significant digits*
- Find the missing parts to some right triangles

### **Lesson 8: Applications**

- Learn the terms: angle of elevation, and angle of depression
- Solve topographical map problems by means of right triangle trigonometry
- Learn what the *bearing of a line* means

### **Lesson 9: Vectors: A Geometric Approach**

- Learn the different notation for vectors and scalars
- Learn about the equality for vectors
- Learn about the addition and subtraction of vectors
- Learn about horizontal and vertical vector components
- Discover that force and work are both vector quantities
- Define static equilibrium

### **Lesson 10: Reference Angle**

- Review how to find exact values for trigonometric functions of angles between  $0^\circ$  and  $90^\circ$
- Learn how to find exact values for trigonometric functions outside of  $90^\circ$
- Be introduced to the “reference angle”
- Learn the reference angle theorem
- Be shown how to find approximations for  $\sin \theta$ ,  $\cos \theta$ ,  $\tan \theta$  on the calculator

### **Lesson 11: Radians and Degrees & Definition III Circular Functions**

- Be introduced to “radian measure”
- Define, “radian”
- Learn how to convert degrees to radians
- Learn how to convert radians to degrees
- Learn the third definition for the trigonometric functions
- Learn how to graph the unit circle on your calculator
- Review the definitions of even and odd functions

### **Lesson 12: Arc Length and Area of a Sector**

- Learn the equation for arc length
- Derive the formula for the area of a sector formed by a central angle

### **Lesson 13: Velocities**

- Learn the definition for *linear velocity*
- Review the two kinds of velocities and the relationship they have to one another

#### **Lesson 14: Basic Graphs and Amplitude**

- Learn how to graph  $Y = \sin X$  by using the unit circle
- Learn how to extend the sine graph
- Learn the definitions for *period*, *amplitude*, and *domain and range*
- Be introduced to the cosine graph and its relationship to the sine graph
- Learn about the tangent graph and how to sketch it
- Learn about all the reciprocal graphs *cosecant*, *cotangent*, and *secant*
- Learn how to graph asymptotes using a calculator
- Consider the effect on a graph of multiplying a trigonometric function by a numerical factor
- How amplitude is determined in the functions

#### **Lesson 15: Period, Reflection, and Vertical Translation**

- Take a closer look into periods
- Generalize how to figure out the amplitude and period for sine and cosine curves
- Generalize how to figure out the range and period for secant and cosecant graphs
- How to reflect about the x-axis
- Learn how to do vertical translations

#### **Lesson 16: Phase Shift & Finding an Equation From Its Graph**

- Consider the equations of the form
$$y = A \sin (Bx + C) \quad B > 0$$
and
$$y = A \cos (Bx + C) \quad B > 0$$
- See how amplitude, period, and phase shift are generalized for cosine functions
- Learn a more specific way of labelling the x –axis
- Learn how to produce an equation that describes a graph, rather than a graph that describes an equation(as you have previously done)
- Learn how to verify trigonometric models by means of a graphing calculator

#### **Lesson 17: Graphing Combinations of Functions**

- Consider the equations of the form
$$y = A \sin (Bx + C) \quad B > 0$$
and
$$y = A \cos (Bx + C) \quad B > 0$$
- See how amplitude, period, and phase shift are generalized for cosine functions
- Learn a more specific way of labelling the x –axis
- Learn how to produce an equation that describes a graph, rather than a graph that describes an equation(as you have previously done)
- Learn how to verify trigonometric models by means of a graphing calculator

### **Lesson 18: Inverse Trigonometric Functions**

- Review the definition of a function and its inverse
- Learn the inverse function notation
- Learn about the inverse sine relation, the inverse sine function, the inverse cosine function, and the inverse tangent function
- Learn how to graph the inverse trigonometric functions using a calculator

## **SECOND SEMESTER**

### **Lesson 19: Proving Identities**

- Review the basic identities
- Use the basic identities, coupled with your knowledge of algebra, to prove other identities
- Learn how to verify identities on your calculator

### **Lesson 20: Sum and Difference Formulas**

- Find out what the formulas for  $\sin(A+B)$  and  $\cos(A+B)$  are

### **Lesson 21: Double-Angle & Half-Angle Formulas**

- Learn how to derive the formulas for  $\sin 2A$  and  $\cos 2A$
- Learn the different forms of double-angle formula for sine and cosine
- Derive formulas for  $\sin A/2$  and  $\cos A/2$
- Find out what *half angles* are and how they are derived

### **Lesson 22: Additional Identities**

- Review identities and extend that knowledge to solve problems that deal with inverse trigonometric functions
- Discover new formulas involving sums and products

### **Lesson 23: Solving Trigonometric Equations**

- Learn what a solution set is
- Review the *addition property of equality* and the *multiplication property of equality*
- Learn how to use your calculator to find zeros
- Learn how to use your calculator to find intersection points

### **Lesson 24: More on Trigonometric Equations**

- Review identities
- Learn how to simplify equations by substituting equivalent expressions
- Learn how to verify solutions on your calculator

### **Lesson 25: Trigonometric Equations Involving Multiple Angles**

- Consider equations that contain multiple angles
- Learn to solve these type of problems using your graphing calculator

### **Lesson 26: Parametric Equations and Further Graphing**

- Learn about *parametric equations*
- Learn how to do *parametric equations* using your graphing calculator
- Learn how to eliminate the parameter
- Learn how to make models more realistic
- Find out mathematics behind the human cannonball stunt

### **Lesson 27: The Law of Sines & The Ambiguous Case**

- Learn about *The Law of Sines*
- Learn a proof for the law
- Learn how to find the missing parts of triangles
- Extend what you know about the law of sines
- Review section 2.4
- Define the word “heading”

### **Lesson 28: The Law of Cosines**

- Learn all about the *Law of the Cosines*
- Learn how to derive the law from the Pythagorean Theorem
- Figure out how to use the law to solve a triangle with missing information

### **Lesson 29: The Area of a Triangle**

- Derive three formulas for the area of triangle “s”
- Learn Heron’s formula

### **Lesson 30: Vectors: An Algebraic Approach**

- Review vectors
- Look at vectors through algebra
- Review and further your knowledge of *standard position*
- Learn about the addition and subtraction with algebraic vectors
- Investigate *scalar multiplication*
- Define a *unit vector*

### **Lesson 31: Vectors: The Dot Product**

- Learn about the *dot product*
- Find the angle between two vectors
- Learn about perpendicular vectors
- Find the equation that calculates work done

### **Lesson 32: Complex Numbers and Their Trigonometric Form**

- Define a *complex number*
- Look into the equality of complex numbers
- Learn about the addition, subtraction, multiplication, and division of complex numbers
- Discover the powers of  $i$
- Review the quadratic formula
- Learn what Cardan's Formula is
- Begin learning how to take the cube roots of complex numbers
- Learn how to write complex numbers in trigonometric form
- Define what the absolute value is for complex numbers
- Learn how to convert complex numbers into trigonometric form using your calculator

### **Lesson 33: Products and Quotients in Trigonometric Form**

- Learn the rule for finding the product of two complex numbers written in trigonometric form
- Learn De Moivre's Theorem

### **Lesson 34: Roots of a Complex Number**

- Learn how to take the root of a complex number
- Learn a theorem for the  $n$ th root of a complex number

### **Lesson 35: Polar Coordinates**

- Review regular coordinates
- Learn about *Polar Coordinates*
- Learn about *Rectangular Coordinates*
- Learn how to convert between the two types of coordinates
- Learn what equations in polar coordinates are

### **Lesson 36: Equations in Polar Coordinates and Their Graphs**

- Consider the graphs of polar equations
- Learn how to create tables for polar equations using your calculator
- Use your calculator to produce polar graphs