Course Objective: Precalculus first expands the applications and understanding of the algebraic, exponential and logarithmic functions. It then develops the trigonometric functions through applications and analytic trigonometry. Students are also introduced to limits in preparation for a later course in calculus. Graphing calculators are an integral part of the course; the technology aids the students in developing problem solving strategies throughout the year.

The tables are a guideline for where to find the material in the text. However, the objectives will drive the curriculum. You may cover the objectives in an order that makes sense for your text, but are responsible for each one being covered by the midterm/final. Throughout the sections students should be using the topics to model and solve real life problems. Each marking period includes a district wide technology activity aligned to the curriculum as highlighted in the tables.

Unit 1: Functions and Their Graphs

1. Apply the concept of slope of a line to write and graph linear equations

    a. Find slope from an equation or two points

    b. Use point slope and slope intercept forms of lines

    c. Use slope to identify and write equations for parallel and perpendicular lines

2. Analyze graphs of functions, and determine if a relation is a function

    a. Determine if a relation between two variables represents a function

    b. Apply the Vertical Line Test to graphs of relations

    c. Determine intervals on which functions are increasing, decreasing, or constant and maximum and minimum values

    d. Describe different types of discontinuity including: removable, jump, infinite

    e. Identify and graph step functions and other piecewise defined functions

    f. Determine if a function is even, odd, or neither

3. Evaluate functions and find their domains

    a. Use function notation to evaluate functions

    b. Find domain and range of a function

4. Use graph shifts, reflections, and nonrigid transformations of functions

    a. Recognize graphs of common functions

    b. Use vertical and horizontal shifts, and reflections to graph functions

       c.   Use vertical shrinks and stretches to graph functions

5.   Develop arithmetic combinations and compositions of functions.

       a.   Perform arithmetic combinations of functions

       b.   Perform composition of functions

       c.   Find domain of a composite function

6.   Formulate inverse functions algebraically and graphically

       a.   Verify algebraically that two functions are inverse

       b.   Apply the horizontal line test to determine if a function has an inverse

       c.   Find inverse functions algebraically

7.   Construct scatter plots and linear models for data both by hand and on the graphing calculator

       a.   Construct scatter plots and interpret correlation

       b.   Find models for data using the graphing calculator

Functions & Graphs	Demana	Larson
Lines in a Plane	P.4	1.1
Functions	1.2	1.2
Graphs of Functions	1.2 (cont)	1.3
Piecewise & Step Functions	1.3	1.3
Transformations of Functions	1.3 & 1.5	1.4
Combinations of Functions	1.4	1.5
Inverse Functions	1.4	1.6
Linear Model (*District Technology Activity*)	1.6 & 2.1	1.7

Unit 2: Polynomial, Rational and Transcendental Functions

1. Sketch and analyze graphs of quadratic and polynomial functions

    a. Determine the basic characteristics of quadratic functions from their equation

    b. Convert a quadratic equation to standard form in order to graph the function

    c. Find the minimum and maximum values with calculator and algebraically

    d. Apply transformations to the basic functions when graphing

    e. Apply the degree and the leading coefficient test to determine end behavior

2. Divide polynomials by other polynomials

    a. Perform long division of polynomials

    b. Perform synthetic division of polynomials

3. Determine the number of rational and real zeros of polynomial functions, and find the zeros

    a. Find and use zeros of polynomial functions in graphing

    b. Apply the Remainder and Factor Theorems

    c. Use the Rational Zero Test to find possible zeros

    d. Use Descartes' Rule of Signs and Upper and Lower Bound Rules to find zeros

    e. Use the Fundamental Theorem of Algebra to determine the number of zeros of a
        polynomial function

    f. Find all the zeros of polynomial functions, including complex zeros

4. Perform operations with complex numbers and plot complex numbers in the complex plane

    a. Perform operations with complex numbers

    b. Use the complex conjugate to write complex numbers in standard form

    c. Plot complex numbers in the complex plane

    d. Find conjugates pairs of complex zero

5. Determine the domains, find the asymptotes, and sketch the graphs of rational functions

    a. Determine the domain of rational functions

    b. Find holes, horizontal, vertical, and slant asymptotes of rational functions

      c.   Use x and y intercepts as aides to graphing

      d.   Determine the end behavior of polynomial functions

Polynomial Functions	Demana	Larson
Quadratic Functions	2.1	2.1
Transformations of Basic Functions	2.2	2.2
Polynomial Functions of Higher Degrees	2.3	2.2
Real Zeros of Polynomial Functions	2.4	2.3
Complex Zeros of Polynomial Functions	2.5	2.4
Fundamental Theorem of Algebra	2.6	2.5
Rational Functions and Asymptotes	2. 7	2.6
Graphs of Rational Functions	2.7	2.7

1. Recognize, evaluate, and graph exponential and logarithmic functions, including their transformations

    a.   Recognize , evaluate, and graph exponential functions with base a

    b.   Graph logarithmic functions

    c.   Recognize, evaluate, and graph natural and common logarithmic functions

    d.   Recognize, evaluate, and graph exponential functions with base e

2. Rewrite logarithmic functions with different bases

3. Use properties of logarithms to evaluate, rewrite, expand or condense logarithmic expressions

    a.   Use the product, quotient, and power rules to rewrite logarithmic expressions

    b.   Use properties of logarithms to expand and condense logarithmic expressions

4. Solve exponential and logarithmic equations

   a. Use the properties of logs and exponents to solve equations

   b. Recognize and evaluate logarithmic functions with base a

5. Use exponential growth, decay, Gaussian, logistic, and logarithmic models to solve real-life problems

   a. Use formulas for compounding and continuous interest

   b. Identify the common form of models (exponential growth and decay, Gaussian model, logistic growth, and logarithm model)

Exponential & Logarithmic Functions	Demana	Larson
Exponential Functions & Graphs	3.1	3.1
Logarithmic Functions & Graphs	3.3	3.2
Properties of Logarithms	3.4	3.3
Solving Exponential & Logarithmic Equations	3.5	3.4
Exponential & Logarithmic Models	3.1 & 3.6	3.5
Non Linear Models	3.2	3.6

MIDTERM

Unit 3: Introduction to Trigonometry and Trigonometric Graphs

1. Describe an angle and convert between degree and radian measure

   a. Identify and sketch angles in standards position and parts of angles

   b. Convert between radians and degree measurements

   c. Sketch and find coterminal angles

   d. Find complements and supplements to angles in degrees and radians

   e. Find arc lengths, linear and angular speed

2. Identify a unit circle and describe its relationship to real numbers

      a.   Identify a unit circle and use it to find values of trigonometric functions

      b.   Use domain and period to evaluate trigonometric functions

3.   Evaluate trigonometric functions of any angle

      a.   Define and find fractional values of the six trigonometric functions

      b.   Use the calculator to evaluate trigonometric functions

      c.   Know and be able to use the values of 30, 45, and 60 degree angles

      d.   Solve right triangles

      e.   Evaluate trig functions for any angle given a point on its terminal side

      f.   Use reference angles to evaluate trig functions

      g.   Apply the distance formula to points in the coordinate plane

4.   Use fundamental trigonometric identities

5.   Sketch graphs of trigonometric functions

      a.   Sketch trig functions using amplitude, period, phase shift and asymptotes

      b.   Sketch translations of trig functions

6.   Evaluate inverse trigonometric functions

7.   Use trigonometric functions to model and solve real life problems

      a.   Use angle of depression, elevation and bearings to solve real world problems

      b.   Use simple harmonic motion formula to model problems

Trigonometric Functions	Demana	Larson
Radian & Degree Measure	4.1	4.1
Right Triangle Trig	4.2	4.3
Unit Circle Trig	4.3	4.2
Trig Functions of any Angle	4.3	4.4
Graphs of Sine & Cosine	4.4	4.5

Graphs of Other Trig Functions	4.5	4.6
Inverse Trig Functions	4.6, 4.7	4.7

Unit 4: Analytic Trigonometry and Limits

1. Use fundamental trigonometric identities to evaluate trigonometric functions and simplify trigonometric expressions

   a. Identify and use fundamental trig identities to evaluate a function

   b. Use factoring with the identities to simplify or verify expressions

2. Verify trigonometric identities

3. Use standard algebraic techniques and inverse trigonometric functions to solve trigonometric equations

   a. Solve trig equations using algebraic techniques, and multiple angle formulas

   b. Use inverse trig functions to solve trig equations

4. Use sum and difference formulas, multiple angle formulas, power reducing formulas, half angle formulas, and product to sum formulas to rewrite and evaluate trigonometric functions

   a. Use sum and difference formulas to evaluate trig functions, verify identities, and solve equations

   b. Use multiple angle, power reducing, half angle, and product and sum formulas to rewrite and evaluate trig functions

5. Use the Law of Sines and the Law of Cosines to solve oblique triangles

   a. Apply the Law of Sines to oblique triangles with AAS and ASA

   b. Apply the Law of Sines to the ambiguous SSA case

   c. Apply the Law of cosines to solve oblique triangles with SSS and SAS

   d. Use Heron's formula to find the area of triangles

Analytic Trigonometry	Demana	Larson
Using Fundamental Identities	5.1	5.1
Verifying Trig Identities	5.2	5.2

Solving Trig Equations	5.1 and Supplemental (Refer to Larson Text)	5.3
Sum & Difference Formulas	5.3	5.4
Multiple, Half Angle, Product and Sum Formulas	5.4	5.5

Additional Topics in Trigonometry	**Demana**	**Larson**
Law of Sines	5.5	6.1
Law of Cosines	5.6	6.2

1. Estimate limits and use properties and operations of limits

    a. Identify, read and write limit notation

    b. Estimate limits from a graph or table of values

    c. Determine whether the limit of a function exists

    d. Find one sided limits

2. Find limits by direct substitution and by using the dividing out and rationalizing techniques

3. Evaluate limits at infinity and find limits of sequences

4. Approximate slopes of tangent lines, use the limit definition of slope

    a. Use a tangent line to approximate slope at a point

    b. Use the limit of the difference quotient to find exact slope at a point

Limits & Intro to Calculus	**Demana**	**Larson**
Introducing Limits	10.3	11.1
Evaluating Limits	10.3	11.2
Tangent Line Problem	10.1	11.3