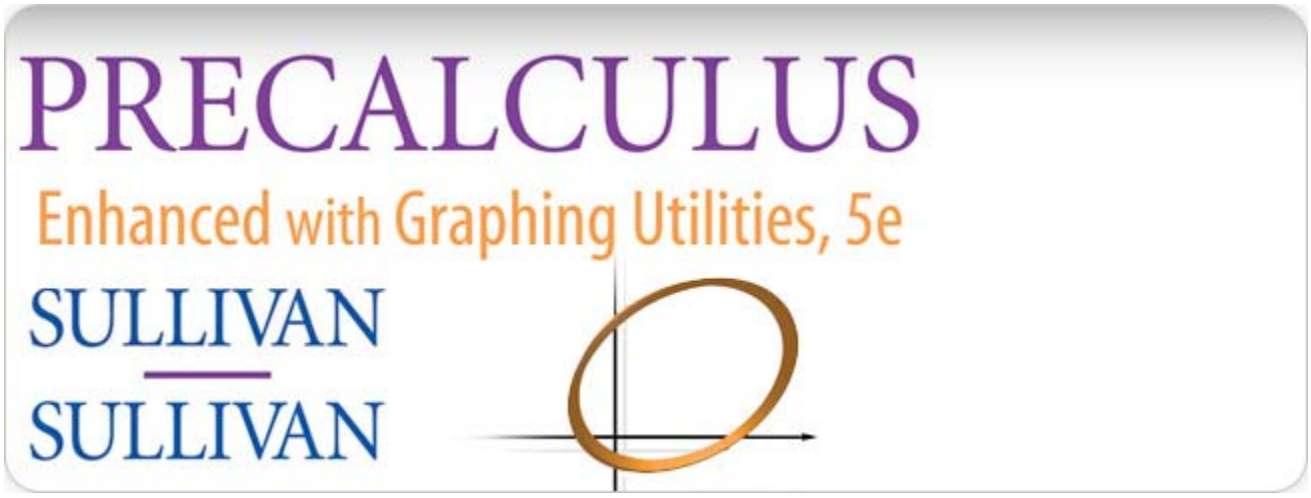
A Correlation of

Precalculus
Enhanced with Graphing Utilities
5th Edition



to the

Alabama Course of Study
Mathematics
Precalculus

ALWAYS LEARNING PEARSON

Introduction

This document demonstrates how ***Precalculus Enhanced with Graphing Utilities* (Sullivan/Sullivan), 5th Edition © 2010**, meets the indicators of the Alabama Course of Study: Mathematics – Precalculus. Correlation page references are to the Student Edition and Instructor's Edition Manual and are cited at the page level.

This text uses the graphing utility to enhance the study of mathematics. Technology is used as a tool to solve problems, motivate concepts, and explore mathematical ideas. Sullivan's Series "Enhanced with Graphing Utilities" provides clear and focused coverage. Many of the problems are solved using both algebra and a graphing utility, and the text illustrates the advantages and benefits of each approach. Technology is used to solve problems when no algebraic solution is available and to help students visualize certain concepts. Topics such as curve-fitting and data analysis ate incorporated as appropriate.

New to the Fifth Edition

Showcase Examples are used to present examples in a guided, step-by-step format.

Model It examples and exercises are meant to develop the student's ability to build models from both verbal descriptions and data.

Exercise Sets at the end of each section remain classified according to purpose. **Mixed Practice** exercises have been added where appropriate so that students may synthesize skills from a variety of sections.

Applied Problems have been updated and many new problems involving sourced information as well as data sets have been added to bring relevance and timeliness to these exercises.

This document demonstrates the success students will achieve using ***Precalculus Enhanced with Graphing Utilities* (Sullivan/Sullivan).**

PRECALCULUS	
Precalculus is a course designed for students who have successfully completed the Algebra II With Trigonometry course. This course is considered to be a prerequisite for success in calculus and college mathematics. Algebraic, graphical, numerical, and verbal analyses are incorporated during investigations of the Precalculus content standards. Parametric equations, polar relations, vector operations, conic sections, and limits are introduced. Content for this course also includes an expanded study of polynomial and rational functions, trigonometric functions, and logarithmic and exponential functions.	
NUMBER AND QUANTITY	
The Complex Number System	
Perform arithmetic operations with complex numbers.	
1. (+) Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers. [N-CN3]	**SE/TE:** 590
Represent complex numbers and their operations on the complex plane.	
2. (+) Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number. [N-CN4]	**SE/TE:** 589-591, 595-596
3. (+) Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation. [N-CN5]	This standard can be addressed when computing with complex numbers: **SE/TE:** 591-592, 595-596
4. (+) Calculate the distance between numbers in the complex plane as the modulus of the difference, and the midpoint of a segment as the average of the numbers at its endpoints. [N-CN6]	**SE/TE:** 7, 14-17
Limits	
Understand limits of functions.	
5. Determine numerically, algebraically, and graphically the limits of functions at specific values and at infinity.	**SE/TE:** 880-884, 885-891, 892-899
a. Apply limits in problems involving convergence and divergence.	**SE/TE:** 880-884, 885-891, 892-899
Vector and Matrix Quantities	
Represent and model with vector quantities.	
6. (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., $\mathbf{v}$, $\|\mathbf{v}\|$, $\|\|\mathbf{v}\|\|$, v). [N-VM1]	**SE/TE:** 597, 599-608
7. (+) Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point. [N-VM2]	**SE/TE:** 600, 606
8. (+) Solve problems involving velocity and other quantities that can be represented by vectors. [N-VM3]	**SE/TE:** 604-608

Perform operations on vectors.	
9. (+) Add and subtract vectors. [N-VM4]	**SE/TE:** 598-599, 601-602, 606-608
a. (+) Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes. [N-VM4a]	**SE/TE:** 598-599, 601-602, 606-608
b. (+) Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum. [N-VM4b]	**SE/TE:** 601-602, 606-608
c. (+) Understand vector subtraction **v** – **w** as **v** + (–**w**), where –**w** is the additive inverse of **w**, with the same magnitude as **w** and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise. [N-VM4c]	This standard can be addressed when adding vectors: **SE/TE:** 598-599, 601-602, 606-608
10. (+) Multiply a vector by a scalar. [N-VM5]	**SE/TE:** 598-599, 602, 606-608
a. (+) Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as c(v_x, v_y) = (cv_x, cv_y). [N-VM5a]	This standard can be addressed when multiplying vectors by a scalar: **SE/TE:** 598-599, 602, 606-608
b. (+) Compute the magnitude of a scalar multiple c**v** using $\|\|c\mathbf{v}\|\| = \|c\|v$. Compute the direction of c**v** knowing that when $\|c\|v \neq 0$, the direction of c**v** is either along **v** (for $c > 0$) or against **v** (for $c < 0$). [N-VM5b]	**SE/TE:** 598-599, 602, 606-608
Perform operations on matrices and use matrices in applications.	
11. (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network. [N-VM6]	**SE/TE:** 731, 734-735, 746, 750, 761-762
12. (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled. [N-VM7]	**SE/TE:** 748-749, 759
13. (+) Add, subtract, and multiply matrices of appropriate dimensions. [N-VM8]	**SE/TE:** 746-762
14. (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties. [N-VM9]	**SE/TE:** 752-753
15. (+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse. [N-VM10]	**SE/TE:** 754-762
16. (+) Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors. [N-VM11]	This standard can be addressed when multiplying matrices: **SE/TE:** 746-762

17. Work with 2 × 2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area. [N-VM12]	This standard can be addressed when multiplying matrices: **SE/TE:** 746-762
ALGEBRA	
Reasoning With Equations and Inequalities	
Solve systems of equations.	
18. (+) Represent a system of linear equations as a single matrix equation in a vector variable. [A-REI8]	**SE/TE:** 724-735
19. (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater). [A-REI9]	**SE/TE:** 757-762
FUNCTIONS	
Conic Sections	
Understand the graphs and equations of conic sections.	
20. Create graphs of conic sections, including parabolas, hyperbolas, ellipses, circles, and degenerate conics, from second-degree equations.	**SE/TE:** 640-648, 651-659, 661-664, 666-672
a. Formulate equations of conic sections from their determining characteristics.	**SE/TE:** 640, 642-648, 650-659, 661, 664, 667, 669-672
Interpreting Functions	
Analyze functions using different representations. *(Logarithmic and trigonometric functions.)*	
21. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. [F-IF7d]	**SE/TE:** 192-202, 203-212, 215, 218
Building Functions	
Build a function that models a relationship between two quantities.	
22. (+) Compose functions. [F-BF1c]	**SE/TE:** 248-255
Build new functions from existing functions.	
23. Determine the inverse of a function and a relation.	**SE/TE:** 258-269
24. (+) Verify by composition that one function is the inverse of another. [F-BF4b]	**SE/TE:** 260, 266-269
25. (+) Read values of an inverse function from a graph or a table, given that the function has an inverse. [F-BF4c]	**SE/TE:** 260-262, 265-267
26. (+) Produce an invertible function from a non-invertible function by restricting the domain. [F-BF4d]	**SE/TE:** 264, 267-269
27. (+) Understand the inverse relationship between exponents and logarithms, and use this relationship to solve problems involving logarithms and exponents. [F-BF5]	**SE/TE:** 285-297
28. Compare effects of parameter changes on graphs of transcendental functions.	**SE/TE:** 273-278, 280-284, 287-290, 293-297, 303, 305

Trigonometric Functions	
Recognize attributes of trigonometric functions and solve problems involving trigonometry.	
29. Determine the amplitude, period, phase shift, domain, and range of trigonometric functions and their inverses.	**SE/TE:** 400-402, 407-410, 420-422, 427-429
30. Use the sum, difference, and half-angle identities to find the exact value of a trigonometric function.	**SE/TE:** 466-475, 479-485
31. Utilize parametric equations by graphing and by converting to rectangular form.	**SE/TE:** 687-690, 697-700
a. Solve application-based problems involving parametric equations.	**SE/TE:** 692-694, 698-700
b. Solve applied problems that include sequences with recurrence relations.	**SE/TE:** 812-816, 828-832
Extend the domain of trigonometric functions using the unit circle.	
32. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$, and use the unit circle to express the values of sine, cosine, and tangent for $\pi - x$, $\pi + x$, and $2\pi - x$ in terms of their values for x, where x is any real number. [F-TF3] 346	**SE/TE:** 368-381, 384-386, 392-395
33. (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions. [F-TF4]	**SE/TE:** 391-395
Model periodic phenomena with trigonometric functions.	
34. (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed. [F-TF6]	**SE/TE:** 440-453, 454-458
35. (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.* [F-TF7]	**SE/TE:** 452-453, 458
Prove and apply trigonometric identities.	
36. (+) Prove the addition and subtraction formulas for sine, cosine, and tangent, and use them to solve problems. [F-TF9]	**SE/TE:** 466-475
GEOMETRY	
Expressing Geometric Properties With Equations	
Translate between the geometric description and the equation for a conic section.	
37. (+) Derive the equations of a parabola given a focus and directrix. [G-GPE2]	**SE/TE:** 642-643, 646-648
38. (+) Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant. [G-GPE3]	**SE/TE:** 650, 653-654, 657-659, 661, 663-664, 667, 670-672

Explain volume formulas and use them to solve problems.	
39. (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures. [G-GMD2]	A review of volume formulas can be found on: **SE/TE:** A16
STATISITCS AND PROBABILITY	
Using Probability to Make Decisions	
Calculate expected values and use them to solve problems.	
40. (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions. [S-MD1]	This standard can be addressed when finding probabilities: **SE/TE:** 864-874
41. (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution. [S-MD2]	This standard can be addressed when finding probabilities: **SE/TE:** 864-874
42. (+) Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. [S-MD3]	This standard can be addressed when finding probabilities: **SE/TE:** 864-874
43. (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. [S-MD4]	This standard can be addressed when finding probabilities: **SE/TE:** 864-874
Use probability to evaluate outcomes of decisions.	
44. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. [S-MD5]	This standard can be addressed when finding probabilities: **SE/TE:** 864-874
a. Find the expected payoff for a game of chance. [S-MD5a]	This standard can be addressed when finding probabilities: **SE/TE:** 864-874
b. Evaluate and compare strategies on the basis of expected values. [S-MD5b]	This standard can be addressed when finding probabilities: **SE/TE:** 864-874