College of San Mateo
Official Course Outline

1. **COURSE ID:** MATH 225 **TITLE:** Path to Calculus
   Units: 6.0 units **Hours/Semester:** 96.0-108.0 Lecture hours; and 192.0-216.0 Homework hours
   Method of Grading: Letter Grade Only
   Prerequisite: MATH 120 or Math 123 or appropriate score on the District math placement test and other measures.

2. **COURSE DESIGNATION:**
   Degree Credit
   Transfer credit: CSU
   AA/AS Degree Requirements:
   CSM - COMPETENCY REQUIREMENTS: C1 Math/Quantitative Reasoning Basic Competency

3. **COURSE DESCRIPTIONS:**
   Catalog Description:
   Equivalent to MATH 130 and 222. This course combines the topics of Trigonometry and Pre-Calculus and is designed to fulfill the requirements of both courses as a prerequisite for MATH 251. Topics include a study of functions, function families, their properties and transformations, compositions, inverses and combinations, complex numbers, and vectors. Function families include linear, trigonometric, logarithmic, exponential, polynomial, power, and rational. Multiple representations of functions are emphasized.

4. **STUDENT LEARNING OUTCOME(S) (SLO'S):**
   Upon successful completion of this course, a student will meet the following outcomes:
   1. Create, manipulate, and interpret mathematical models based on elementary functions or combinations of elementary functions through real world applications
   2. Apply graphing methods to be able to synthesize graphical concepts to check algebraic solutions, as well as, to find solutions where algebraic ones are not possible
   3. Work with and apply the algebraic relationships among the six trig functions: use algebra and identities to derive other identities, verify identities, simplify expressions, and solve trigonometric equations

5. **SPECIFIC INSTRUCTIONAL OBJECTIVES:**
   Upon successful completion of this course, a student will be able to:
   1. Analyze symbolic and graphical representations of functions --polynomial, absolute value, radical, rational, exponential, logarithmic, and trigonometric function families including their domains, ranges and transformations
   2. Create, analyze, and solve mathematical models describing real life applications
   3. Create, verify, and use inverse functions both graphically and symbolically
   4. Apply right and oblique triangle trigonometry including vectors and other applications
   5. Prove trigonometric identities and simplify trigonometric expressions
   6. Solve a variety of equations and inequalities including absolute value, radical, rational, exponential, logarithmic, trigonometric, and polynomial in addition to solving systems of equations and inequalities
   7. Describe the short run and long run behavior of polynomial and rational functions
   8. Graph functions and relations in rectangular and polar coordinates
   9. Identify special triangles and their related angle an side measures
   10. Evaluate trigonometric functions at angles given in both degrees and radian
   11. Graph the basic trigonometric functions and apply changes in period, phase, and amplitude to generate new graphs
   12. Evaluate and graph inverse trigonometric functions
   13. Convert between polar and rectangular coordinates
   14. Calculate powers and roots of complex numbers using DeMoivre's Theorem
   15. Represent a vector in both set and unit vector notation

6. **COURSE CONTENT:**
   Lecture Content:
   FUNCTIONS AND THEIR GRAPHS
   A. Study characteristics such as domain, range, difference quotients, one-to-oneness, inverses, evenness/oddness of basic families of functions including linear, polynomial, rational, radical,

absolute value, logarithmic and trigonometric
B. Graphs of the basic function families and their vertices (as appropriate) along with transformations and translations such as horizontal and vertical reflections, stretches, and compressions
C. Vertices and zeros of functions including the basic function families
D. Algebra of functions, including composition, inverses, and recognizing the relationship between functions and their inverses graphically
E. Solve systems of equations and inequalities
F. Piecewise-defined functions
G. Graph functions and relations in rectangular coordinates and polar coordinates
H. Graph and solve linear equations and systems of equations and inequalities

POLYNOMIAL FUNCTIONS
A. Models using polynomial functions
B. Factors of nth degree polynomials: basic factoring methods and/or technology
C. Polynomial graphs: leading coefficient, degree of the polynomial, symmetry tests, behavior at the intercepts, and end behavior
D. Solutions to polynomial inequalities using both graphs and sign charts
E. Characterization of real and complex zeros of polynomials

RATIONAL FUNCTIONS
A. Graphs and equations of rational functions: intercepts, vertical and horizontal asymptotes, asymptotic behavior, and holes
B. Solutions to rational inequalities using both graphs and sign charts

EXPONENTIAL AND LOGARITHMIC FUNCTIONS
A. Graphs of exponential and logarithmic functions
B. Exponential and logarithmic equations and properties
C. Exponential growth/decay models

TRIGONOMETRY
A. Definitions, applications, and graphs of the six trigonometric functions and ratios and their inverses according to the right triangle and the unit circle
B. Evaluate and solve for angular measure in both degrees and radians
C. Trigonometric function values of special angles or any real number both as angle-side relationships in right triangles and ordered pairs on a unit circle.
D. Graphs of basic trigonometric functions including applicable asymptotes, along with changes in amplitude, period, and phase shifts
E. Use trigonometric identities to simplify expressions, solve equations, and prove identities
F. Solve trigonometric equations
G. Application problems using right triangle trigonometry, the Law of Sines, and the Law of Cosines
H. Introduction to vectors including representing a vector in both set and unit vector notation.
I. Graphs of inverse trigonometric functions
J. Polar coordinate and equations
K. DeMoivre's Theorem and applications.

7. **REPRESENTATIVE METHODS OF INSTRUCTION:**
Typical methods of instruction may include:
A. Lecture
B. Activity
C. Individualized Instruction
D. Observation and Demonstration

8. **REPRESENTATIVE ASSIGNMENTS**
Representative assignments in this course may include, but are not limited to the following:
Writing Assignments:
Writing problem solving based on the content of the daily lecture.
Reading Assignments:
Reading 5-10 pages in the textbook per week.
Other Outside Assignments:
N/A

To be Arranged Assignments:
N/A

9. **REPRESENTATIVE METHODS OF EVALUATION**
Representative methods of evaluation may include:
   A. Class Work
   B. Exams/Tests
   C. Group Projects
   D. Homework
   E. Quizzes

10. **REPRESENTATIVE TEXT(S):**
Possible textbooks include:
   A. Connally, E. *Functions Modeling Change*, 5th ed. Wiley, 2014

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Course Originator: Christopher Walker