Mathematics
Course: Pre-Calculus
11th Grade

MATH 502 Pre-Calculus

      1/2 credit
      5 days per week (2nd Semester)
      Taught in English

      This is a required class for all 11th grade students in the Mexican and/or U.S. diploma program. This course provides students with the background necessary for a study of calculus. It includes a review of algebra, properties of functions such as: quadratic, piecewise, polynomial, rational, exponential and logarithmic functions and their graphs. Students as well, will be introduced to limits and continuity of functions.

Textbook: Larson, Ron and Falvo, David C. <u>Pre-Calculus</u>. Brooks/Cole Cengage Learning: Belmont, California. 2014 (9th Edition).
Prerequisite: MATH 501

Benchmark Code – Subject: Pre-Calculus 2 = PC2 Strand

1: Fundamental Skills and Concept Review

Strand 2: Functions and Their Graphs

Strand 3: Quadratic Functions

Strand 4: Piecewise Functions

Strand 5: Polynomial Functions

Strand 6: Rational Functions

Strand 7: Exponential and Logarithmic Functions Strand 8:

Limits and Continuity

Subject.Grade.Strand#.Standard#. Benchmark#

Example: PC2.11.1.1.3 – Pre-Calculus 2, Grade 11, Strand 1, Standard 1, Benchmark 3

Strand 1: Fundamental Skills and Concepts Review

Standard 1: The student simplifies and solves equations with different algebraic techniques.

Benchmark Code	Benchmark
PC2.11.1.1.1	The student will simplify expressions using exponent and radical laws and properties.
PC2.11.1.1.2	The student will simplify expressions with radicals using rationalization and conjugates.
PC2.11.1.1.3	The student will multiply polynomials. (special product formulas)
PC2.11.1.1.4	The student will divide polynomials. (long and synthetic division)
PC2.11.1.1.5	The student will factor expressions completely. (greatest common factor, difference of squares, perfect square trinomial, sum and difference of cubes, trinomials with leading coefficient of 1, trinomials with leading coefficient different that 1, grouping, rational zero theorem)

PC2.11.1.1.6	The student will add, subtract, multiply and divide rational expressions of two or more terms.
PC2.11.1.1.7	The student will simplify rational expressions and compound fractions, of two or more terms, using factorization.
PC2.11.1.1.8	The student will solve rational equations of two or more terms.
PC2.11.1.1.9	The student will write and sketch circle equations.

Strand 2: Functions and Their Graphs

Standard 1: The student graphs functions, solves equations, solves problems using functions, and analyzes graphs of functions.

Benchmark Code	Benchmark
PC2.11.2.1.1	The student will determine how a relation is a function.
PC2.11.2.1.2	The student will find domain and range from the graph of a function.
PC2.11.2.1.3	The student will find domain and range from the equation of a function.
PC2.11.2.1.4	The student will determine the increasing and decreasing intervals of a function.
PC2.11.2.1.5	The student will identify the three types of symmetry, and identify even and odd functions.
PC2.11.2.1.6	The student will identify the graphs of linear, quadratic, rational, square root, absolute value, cubic, greatest integer functions.
PC2.11.2.1.7	The student will write the equation of the graphs of linear, quadratic, rational, square root, absolute value, cubic, greatest integer functions.
PC2.11.2.1.8	The student will apply function transformation (vertical and horizontal shift, reflections, and vertical and horizontal stretching and shrinking).
PC2.11.2.1.9	The student will evaluate functions.
PC2.11.2.1.10	The student will find the zeros of a function.
PC2.11.2.1.11	The student will combine functions by adding, subtracting, multiplying, and dividing functions.
PC2.11.2.1.12	The student will find the composition of one function with another function.
PC2.11.2.1.13	The student will find the domain of a combination and composition of functions.
PC2.11.2.1.14	The student will find and graph inverse functions.

Strand 3: Quadratic Functions

Standard 1: The student will write, graph and apply quadratic functions.

Benchmark Code	Benchmark
PC2.11.3.1.1	The student will define the quadratic function.
PC2.11.3.1.2	The student will rewrite the quadratic equation from general to standard form.

PC2.11.3.1.3	The student will find the zeros and identify the vertex, y-intercept and axis of symmetry to graph the quadratic function.
PC2.11.3.1.4	The student will find how many real solutions does the quadratic function have using the discriminant.
PC2.11.3.1.5	The student will write the complex solutions of a quadratic function with imaginary numbers.
PC2.11.3.1.6	The student will find the domain and range of a quadratic functions.
PC2.11.3.1.7	The student will find the quadratic equation from the graph using the vertex and a point.
PC2.11.3.1.8	The student will model application problems using quadratic functions.

Strand 4: Piecewise Functions

Standard 1: The student will write, evaluate and graph piecewise functions.

Benchmark Code	Benchmark
PC2.11.4.1.1	The student will define a piecewise function.
PC2.11.4.1.2	The student will write a piecewise function from a graph.
PC2.11.4.1.3	The student will graph a piecewise function from the equation.
PC2.11.4.1.4	The student will evaluate a piecewise function from the graph and the equation.
PC2.11.4.1.5	The student will find the domain and range of a piecewise function.

Strand 5: Polynomial Functions

Standard 1: The student factors and simplifies polynomial expressions, and evaluates and graphs polynomial functions.

Benchmark Code	Benchmark
PC2.11.5.1.1	The student will define a polynomial function of higher degree.
PC2.11.5.1.2	The student will identify the degree, leading term, leading coefficient and constant term of a polynomial.
PC2.11.5.1.3	The student will find the end behavior of a polynomial function by the degree and the sign of the leading coefficient.
PC2.11.5.1.4	The student will find the maximum number of turning point on a polynomial function.
PC2.11.5.1.5	The student will find local extrema of polynomials.
PC2.11.5.1.6	The student will factor polynomials to find the zeros of the function.
PC2.11.5.1.7	The student will use the zero factor theorem and rational zero theorem (p's and q's) to find the zeros of a polynomial function.
PC2.11.5.1.8	The student will determine the even or odd multiplicity of the zeros of a polynomial function.
PC2.11.5.1.9	The student will graph a polynomial function of higher degree.

PC2.11.5.1.10	The student will find the domain and range of a polynomial function.
PC2.11.5.1.11	The student will use a graphing calculator to graph polynomial functions and find the real zeros and local extrema of the graph.

Strand 6: Rational Functions

Standard 1: The student will write, evaluate and graph rational functions.

Benchmark Code	Benchmark
PC2.11.6.1.1	The student will define a rational function.
PC2.11.6.1.2	The student will find the vertical and horizontal asymptotes of a rational function.
PC2.11.6.1.3	The student will find the x- and y-intercepts of a rational function.
PC2.11.6.1.4	The student will identify and find holes of rational functions.
PC2.11.6.1.5	The student will graph a rational function.
PC2.11.6.1.6	The student will find the domain and range of a rational function.

Strand 7: Exponential and Logarithmic Functions

Standard 1: The student simplifies expressions and solves exponential and logarithmic equations.

Benchmark Code	Benchmark
PC2.11.7.1.1	The student will define an exponential function.
PC2.11.7.1.2	The student will evaluate an exponential function.
PC2.11.7.1.3	The student will use a graphing calculator to find a table of values to graph exponential functions.
PC2.11.7.1.4	The student will use function transformations to graph exponential equations.
PC2.11.7.1.5	The student will find the exponential equation from the graph of the function using one point.
PC2.11.7.1.6	The student will find asymptote and the domain and range of a exponential function.
PC2.11.7.1.7	The student will define logarithmic expressions.
PC2.11.7.1.8	The student will evaluate logarithmic expressions.
PC2.11.7.1.9	The student will use a graphing calculator to find a table of values to graph exponential functions.
PC2.11.7.1.10	The student will use function transformations to graph logarithmic functions.
PC2.11.7.1.11	The student will find asymptote and the domain and range of a logarithmic function.
PC2.11.7.1.12	The student will write exponential equations in logarithmic form and vice versa.

PC2.11.7.1.13	The student will simplify and evaluate expressions using properties of logarithms.
PC2.11.7.1.14	The student will combine and expand logarithmic expressions using Logarithm Laws.
PC2.11.7.1.15	The student will solve exponential and logarithmic equations using properties and logarithm laws.

Strand 8: Limits and Continuity

Standard 1: The student will define and find limits of functions.

Benchmark Code	Benchmark
PC2.11.8.1.1	The student will define limits.
PC2.11.8.1.2	The student will find limits of functions graphically and numerically.
PC2.11.8.1.3	The student will use the properties of limits to evaluate limits of functions.
PC2.11.8.1.4	The student will use different analytical techniques to evaluate limits of functions.
PC2.11.8.1.5	The student will evaluate one-sided limits.
PC2.11.8.1.6	The student will recognize unbounded behavior of functions.
PC2.11.8.1.7	The student will evaluate limits to infinity and infinity limits.

Standard 2: The student will find the discontinuities of a function.

Benchmark Code	Benchmark
PC2.11.8.2.1	The student will define the continuity of a function.
PC2.11.8.2.2	The student will find determine the types of discontinuity of functions, as removable and non-removable discontinuity.
PC2.11.8.2.3	The student will determine the continuity intervals of a function.