

Pre Calculus 3126

Course description:

Precalculus is an advanced mathematics course that uses meaningful problems and appropriate technologies to build upon previously learned mathematical concepts to develop the underpinnings of calculus.

Standard 1.0: Models for Real-World Phenomena

Students will model and analyze real-world phenomena using techniques from algebra and data analysis.

Learning Expectations:

The student will:

- 1.1 select and use appropriate algebraic functions to model real-world situations;
- 1.2 select and use appropriate techniques from data analysis to model real-world phenomena.

Student Performance Indicators:

model real-world phenomena using techniques of data analysis;
recognize and apply mathematical models of linear, quadratic, exponential, logarithmic, and trigonometric functions;
use scatterplot residuals, and/or correlation coefficients to determine whether a model is appropriate;
apply equations and graphs of conic sections to model real-world phenomena.
use models when appropriate to draw conclusions or make predictions.

Standard 2.0: Algebraic Functions

Students will extend the concepts of function from earlier courses to a wider variety of functions and their graphs and real-world applications.

Learning Expectations:

The student will:

- 2.1 represent a variety of functions graphically;
- 2.2 use a variety of methods to analyze and interpret functions;
- 2.3 determine the slope and equations of lines tangent to curves;
- 2.4 apply functions in problem situations.

Student Performance Indicators:

sketch the graphs of the basic functions (linear, quadratic, cubic, square root, absolute value, reciprocal, trigonometric, exponential, logarithmic, and greatest integer);
graph transformations and combinations of transformations for all basic functions;
analyze functions, such as by decomposing into simpler functions;
determine if a function is even, odd, or neither;
use an appropriate technology to solve inequalities;
demonstrate an understanding of the concept of the limit of a function;
apply the limit of a function to find the slope of a line tangent to a curve;
write equations of tangents and normals to conic sections;
apply limits to develop the concept of continuity and identify intervals of increase and decrease;
locate critical points on the graphs of polynomial functions and determine if each critical point is a minimum, a maximum, or a point of inflection;

determine an equation of a rational function from a written description.
define and use the logarithmic function as the inverse of the exponential function;
sketch the graphs of exponential and logarithmic functions;
solve exponential and logarithmic equations modeling real-world problems (e.g. growth and decay).

Standard 3.0: Trigonometric Functions

The student will

- 3.1 apply trigonometry concepts and applications to model and solve problems;
- 3.2 use trigonometric concepts to represent, apply, and operate with complex numbers;
- 3.3 solve trigonometric equations and inequalities algebraically or graphically;
- 3.4 interpret transformations of trigonometric functions.

Student Performance Indicators:

define six circular functions;
sketch graphs of the six trigonometric functions involving period change, amplitude change, phase shift, and/or vertical shift;
use trigonometric functions to model periodic phenomena;
use graphs to develop and verify trigonometric identities;
find values of inverse trigonometric functions, applying appropriate domain and range restrictions;
solve trigonometric equations and inequalities either algebraically or using graphing technology.
derive the Law of Sines and the Law of Cosines and apply them to solve problems involving triangles and vectors;
derive and apply the formulas for the area of a triangle and the sector of a circle;
understand the relationship between measurements in radians and degrees;
apply radian measures in problems related to linear and angular velocity;
understand and apply vectors to solve real world problems;
represent complex numbers in both rectangular and polar form;
apply the trigonometric form of complex number in calculations;
prove and apply DeMoivre's Theorem to find roots and powers of complex numbers.

Standard 4.0: Sequences and Series

Students will develop the concept of limit by examining infinite sequences and series.

Learning Expectations:

The student will:

- 4.1 represent sequences and series;
- 4.2 determine, when possible, the sums of infinite series.

Student Performance Indicators:

demonstrate an understanding of sequences by representing them recursively and explicitly;
use sigma notation to represent a series;
determine whether a given series converges or diverges;
find the sum of an infinite series that converge;
find the sum of an infinite geometric series;
use the Binomial Theorem to expand binomials.