MATH-1580: PRECALCULUS

Cuyahoga Community College

Viewing:MATH-1580 : Precalculus

Board of Trustees:
2018-06-28

Academic Term:
Summer 2019

Subject Code
MATH - Mathematics

Course Number:
1580

Title:
Precalculus

Catalog Description:
Intensified course designed to prepare students for calculus. Study of real numbers, equations and inequalities, functions and graphs, sequences and series, theory of equations, systems of equations and inequalities, mathematical induction, conic sections, exponential and logarithmic functions, trigonometric functions and complex numbers. Applications and activities to build skills in problem solving also included.

Credit Hour(s):
5

Lecture Hour(s):
5

Lab Hour(s):
0

Other Hour(s):
0

Requisites
Prerequisite and Corequisite
Sufficient score on assessment test, or departmental approval: previous trigonometry or algebra/trigonometry course in high school or college.

I. ACADEMIC CREDIT

Academic Credit According to the Ohio Department of Higher Education, one (1) semester hour of college credit will be awarded for each lecture hour. Students will be expected to work on out-of-class assignments on a regular basis which, over the length of the course, would normally average two hours of out-of-class study for each hour of formal class activity. For laboratory hours, one (1) credit shall be awarded for a minimum of three laboratory hours in a standard week for which little or no out-of-class study is required since three hours will be in the lab (i.e. Laboratory 03 hours). Whereas, one (1) credit shall be awarded for a minimum of two laboratory hours in a standard week, if supplemented by out-of-class assignments which would normally average one hour of out-of-class study preparing for or following up the laboratory experience (i.e. Laboratory 02 hours). Credit is also awarded for other hours such as directed practice, practicum, cooperative work experience, and field experience. The number of hours required to receive credit is listed under Other Hours on the syllabus. The number of credit hours for lecture, lab and other hours are listed at the beginning of the syllabus. Make sure you can prioritize your time accordingly. Proper planning, prioritization and dedication will enhance your success in this course.

The standard expectation for an online course is that you will spend 3 hours per week for each credit hour.
II. ACCESSIBILITY STATEMENT

If you need any special course adaptations or accommodations because of a documented disability, please notify your instructor within a reasonable length of time, preferably the first week of the term with formal notice of that need (i.e. an official letter from the Student Accessibility Services (SAS) office). Accommodations will not be made retroactively.

For specific information pertaining to ADA accommodation, please contact your campus SAS office or visit online at http://www.tri-c.edu/accessprograms/. Blackboard accessibility information is available at http://access.blackboard.com.

III. ATTENDANCE TRACKING

Regular class attendance is expected. Tri-C is required by law to verify the enrollment of students who participate in federal Title IV student aid programs and/or who receive educational benefits through other funding sources. Eligibility for federal student financial aid is based in part on enrollment status.

Students who do not attend classes for the entire term are required to withdraw from the course(s). Additionally, students who withdraw from a course or stop attending class without officially withdrawing may be required to return all or a portion of their financial aid based on the date of last attendance. Students who do not attend the full session are responsible for withdrawing from the course(s).

Tri-C is responsible for identifying students who have not attended a course before financial aid funds can be applied to students’ accounts.

Therefore, attendance is recorded in the following ways:

- For in-person and blended-learning courses, students are required to attend the course by the 15th day of the semester (or equivalent for terms shorter than five weeks) to be considered attending. Students who have not met all attendance requirements for in-person and blended courses, as described herein, within the first two weeks or equivalent, will be considered not attending.
- For online courses, students are required to login at least two times per week and submit one assignment per week for the first two weeks of the semester, or equivalent to the 15th day of the term. Students who have not met all attendance requirements for online courses, as described herein, within the first two weeks or equivalent, will be considered not attending.

At the conclusion of the first two weeks of a semester or equivalent, instructors report any registered students who have “Never Attended” a course. Those students will be administratively withdrawn from that course. However, after the time period in the previous paragraphs, if a student stops attending a class or wants or needs to withdraw, for any reason, it is the student’s responsibility to take action to withdraw from the course. Students must complete and submit the appropriate Tri-C form by the established withdrawal deadline.

Tri-C is required to ensure that students receive financial aid only for courses that they attend and complete. Students reported for not attending at least one of their registered courses will have all financial aid funds held until confirmation of attendance in registered courses has been verified. Students who fail to complete at least one course may be required to repay all or a portion of their federal financial aid funds and may be ineligible to receive future federal financial aid awards. Students who withdraw from classes prior to completing more than 60 percent of their enrolled class time may be subject to the required federal refund policy.

If illness or emergency should necessitate a brief absence from class, students should confer with instructors upon their return. Students having problems with coursework due to a prolonged absence should confer with the instructor or a counselor.

IV. LEARNING OUTCOMES ASSESSMENT

Occasionally, in addition to submitting assignments to their instructors for evaluation and a grade, students will also be asked to submit completed assignments, called ‘artifacts,’ for assessment of course and program outcomes and the College’s Essential Learning Outcomes (ELOs). The artifacts will be submitted in Blackboard or a similar technology. The level of mastery of the outcome demonstrated by the artifact DOES NOT affect the student’s grade or academic record in any way. However, some instructors require that students submit their artifact before receiving their final grade. Some artifacts will be randomly selected for assessment, which will help determine improvements and support needed to further student success. If you have any questions, please feel free to speak with your instructor or contact the Learning Outcomes Assessment office.

V. CONCEALED CARRY STATEMENT

College policy prohibits the possession of weapons on college property by students, faculty and staff, unless specifically approved in advance as a job-related requirement (i.e., Tri-C campus police officers) or, in accordance with Ohio law, secured in a parked vehicle in a designated parking area only by an individual in possession of a valid conceal carry permit.

As a Tri-C student, your behavior on campus must comply with the student code of conduct which is available on page 29 within the Tri-C student handbook, available athttp://www.tri-c.edu/student-resources/documents/studenthandbook.pdf. You must also comply with the College’s Zero Tolerance for Violence on College Property available athttp://www.tri-c.edu/policies-and-procedures/documents/3354-1-20-10-zero-tolerance-for-violence-policy.pdf.
Outcomes

Course Outcome(s):
Represent functions verbally, numerically, graphically and algebraically.

Objective(s):
1. Define and identify relation, domain, range, function.
2. Identify and perform transformations of functions.
3. Define, identify, and analyze linear, quadratic, polynomial, rational, root/radical/power and piece-wise functions algebraically and graphically, including the domain and range.
4. Determine the vertex of a quadratic function.
5. Identify and determine asymptotes of rational functions.
7. Determine exact and/or approximate zeros and sketch the graphs of polynomial functions of degree greater than two.
8. Use the Remainder Theorem and Factor Theorems for polynomial functions including the Fundamental Theorem of Algebra and the Rational Zero Theorem.
9. Define and determine zeros or roots of a polynomial function including irrational and complex zeros, based on operations with complex numbers.
10. Determine intervals on which the function is increasing, decreasing or constant.
11. Determine algebraically and graphically whether the graph of an equation exhibits symmetry.
12. Use the vertical line test to identify functions.
13. Graph functions and their inverses.
14. Determine if a function is even or odd.
15. Identify and determine relative maximum and minimum values in an interval of a function.
17. Determine the domain and ranges of exponential and logarithmic functions.
18. Graph exponential and logarithmic functions using their properties.
19. Identify Properties of Logarithmic functions including the Product, Quotient, Power, and Change of Base Rules and use the properties to rewrite logarithmic functions.
20. Define and evaluate common and natural logarithms.
21. Use functions to model quadratics, polynomials, rationals, and radicals to solve a variety of real-world problem-solving applications.
22. Use the horizontal line test to determine if a function is one-to-one.
23. Define and determine inverse functions algebraically.
24. Perform operations (sum, difference, product, and quotient) on functions and determine the domain of the resulting functions.
25. Divide a polynomial function by a linear function using synthetic division.
26. Divide a polynomial function by a polynomial function using long division.
27. Determine the composite of two functions and the domain of the composite function.
28. Decompose a function as a composite.

Course Outcome(s):
Solve equations.

Objective(s):
1. Apply the definition of absolute value to solve linear equations.
2. Use the one-to-one property of exponential functions to solve one-to-one exponential equations.
3. Use the Properties of Logarithms and the one-to-one property of logarithmic functions to solve one-to-one logarithmic equations.
4. Use the inverse relationship between the exponential function and logarithmic function to solve exponential and logarithmic equations.
5. Evaluate applications involving exponential and logarithmic functions and equations including exponential growth and decay and periodic and continuous compounding.

Course Outcome(s):
Solve inequalities.

Objective(s):
1. Solve quadratic, polynomial and rational inequalities in one variable.
2. Write the solution using set builder notation.
3. Write the solution using interval notation.
4. Graph the solution using the appropriate graph.
5. Apply the definition of absolute value to solve linear, polynomial, and rational absolute value inequalities.
Course Outcome(s):
Define and evaluate trigonometric functions.

Objective(s):
1. Apply the arc length in problems concerning linear speed and angular speed.
2. Graph the six circular functions using transformations and state their properties including domain, range, period, phase shift, and amplitude.
4. Apply definition of radian measure and convert to and from degree measure of angles.
5. Use a calculator to find function values and angles.
6. Define the trigonometric functions using a unit circle.
7. Define and find the length of an arc of a circle and the measure of a central angle of a circle.

Course Outcome(s):
Analyze, define, and interpret analytic trigonometry and right triangles.

Objective(s):
1. Solve various trigonometric equations using proven identities and algebra.
2. Use the Pythagorean Theorem to solve right triangles and the trigonometric functions.
3. Solve applied problems involving right triangles and trigonometric functions.
4. Solve trigonometric equations.
5. Apply and prove Pythagorean, Sum/Difference, Cofunction, and Double Angle trigonometric identities and more complex trigonometric formulas not proven in the text.
6. Define and evaluate the inverse trigonometric functions under domain restrictions.
7. Solve real-world trigonometric problems using inverse trigonometric functions.

Course Outcome(s):
Analyze, interpret, and solve applications of trigonometry.

Objective(s):
1. Solve different triangles using the Law of Sines and/or the Law of Cosines.
2. Solve applied trigonometric problems using the Law of Sines and/or the Law of Cosines.
3. Define and express a complex number in algebraic, trigonometric, and graphical form.
4. Perform operations with complex numbers.
5. Define and graph polar coordinates and equations.
6. Define vectors and their properties.
7. Use technology such as a graphing calculator or computer algebra system to graph, compute, evaluate, and estimate, as appropriate.

Course Outcome(s):
Define, determine, and graph conic sections and solve systems of linear equations and non-linear systems of equations and inequalities.

Objective(s):
1. Define and use the distance and midpoint formulas.
2. Define and identify circles, ellipses, parabolas, and hyperbolas graphically.
3. Define and identify circles, ellipses, parabolas, and hyperbolas algebraically in standard and general forms.
4. Graph the conic sections centered at the origin and at the point \((h, k)\) using the center, radius, major and minor axes, vertices, foci, directrix, axis of symmetry, and oblique asymptotes as necessary.
5. Solve a system of linear equations of with two and three variables using the substitution and elimination method.
6. Decompose a rational partial fraction.
7. Solve systems of nonlinear equations using the substitution and elimination methods.
8. Solve systems of non-linear inequalities graphically.
9. Model and solve real life application of conic sections including wheels, radar dish, support cables, and Earth's orbit.

Course Outcome(s):
Recognize and differentiate arithmetic and geometric sequences and series, and determine specified terms and their sums if they exist.

Objective(s):
1. Define and identify arithmetic and geometric sequences and series.
2. Determine the general term of a sequence.
3. Determine the sum of a series.
4. Determine the sum of the first $n$ terms of an arithmetic sequence.
5. Determine the sum of the first $n$ terms of a geometric sequence.
6. Determine the sum of an infinite geometric sequence.

**Methods of Evaluation:**
1. Periodic exams
2. Quizzes
3. Homework
4. In class collaborative work
5. Comprehensive final exam

**Course Content Outline:**
1. Fundamental concepts of algebra
   a. Properties and operations of real numbers
   b. Absolute value equations and inequalities
   c. Exponents and radicals
   d. Algebraic expressions
   e. Equations and inequalities
      i. interval notation
      ii. solutions of linear and higher degree equations and inequalities, including rational inequalities
   f. Elementary analytic geometry
      i. Cartesian plane
      ii. distance and midpoint formulas
      iii. symmetry
      iv. equations of a line and circle
2. Functions and their graphs
   a. Notation, definition, operations and domain of functions
   b. Graphs of functions
      i. horizontal and vertical shifts
      ii. reflection, compression, and expansion
      iii. even and odd functions
      iv. increasing, decreasing and constant functions
   c. Composite and inverse functions
3. Polynomial and rational functions
   a. Synthetic division
   b. Finding zeros, real and complex
      i. Remainder and Factor Theorem
      ii. Descartes’ Rule of Signs
      iii. Rational Root Theorem
      iv. complex and irrational zeros
      v. graphics calculator
   c. Horizontal, vertical and oblique asymptotes
   d. Graphing
4. Exponential functions
5. Logarithmic functions and their properties
6. Exponential and logarithmic equations and applications
7. Trigonometric functions
   a. Radian and degree measure
   b. Trigonometric functions of angles and the unit circle
   c. Trigonometric graphs
   d. Applications involving right triangles
   e. Trigonometric identities
   f. Trigonometric equations
   g. Formulae for sum/difference and multiple angles
   h. Inverse trigonometric functions
8. Applications of trigonometry
a. Law of Sines
b. Law of Cosines
c. Complex numbers, definitions and operations
d. DeMoivre’s Theorem
e. nth roots of complex numbers
f. Vectors
   i. definition and geometric representation
   ii. applications

9. Systems of equations and inequalities
   a. Systems of equations
   b. Systems of linear equations in more than two variables
   c. partial fractions

10. Sequences and series
    a. Sequence functions and summation notation
    b. Arithmetic sequences and series
    c. Geometric sequences and series
    d. Mathematical induction
    e. Binomial Theorem

11. Analytic geometry
    a. Parabola
    b. Ellipse
    c. Hyperbola
    d. Plane curves and parametric equations
    e. Polar coordinates and graphs of polar equations

12. Optional topics:
    a. Harmonic motion
    b. Matrices

Resources


Resources Other
Software provided with textbook

Instructional Services

OAN Number:
TMM002

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