Piedmont Governor's School for Mathematics, Science & Technology

Precalculus with Trigonometry MTH 167
Dual Enrollment

Instructor: Mrs. Ashley D. Gravett
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Textbook: *PreCalculus.* (4th edition). J. Douglas Faires & James DeFranza. Thomson: Brooks/Cole, 2007.
          Supplemental Text: *Precalculus: Functions and Graphs*. (2nd edition).
Dugopolski, Mark. Pearson, 2005.

Credit Hours: 5 (Lecture Hours: 5)

Prerequisites: Placement recommendation for MTH 166 & Algebra I, Algebra II, & Geometry or equivalent
          (Credit will not be awarded for both MTH 163 & MTH 166)

Course Description: This is an advanced pre-calculus course that includes the study of power, polynomial, rational, exponential, and logarithmic functions, systems of equations, trigonometry, trigonometric applications, and an introduction to conics. This course provides the level of rigor expected from Calculus I students in regards to pacing and workload.

Learner Outcomes: Upon completion of this course, the student should:

1. Demonstrate an understanding of basic mathematical skills used in applied precalculus.
2. Understand and communicate clearly and effectively mathematical principles, using proper vocabulary and nomenclature.
3. Apply the principles of precalculus to solve applied problems in mathematics, as well as in other disciplines.
4. Use mathematics in a technological environment.
5. Develop effective study skills in order to master course content and objectives.
6. Demonstrate a three prong approach to problem solving and develop an understanding of rates of change for various functions.
7. Develop the mathematical skills and concepts necessary for a successful calculus experience.
8. **SCHEV Competencies:** Quantitative Reasoning, Scientific Reasoning, Critical Reasoning, Technology
9. **DCC Educational Objectives:** Critical Thinking, Computational and Computer Skills, Understanding Science and Technology

Methods of Instruction: Instructional Methods shall include but are not limited to direct instruction, individual and group activities.

Course Content:

1. Relations and Functions
    a. Distinguish between relations and functions
    b. Evaluate functions both numerically and algebraically
    c. Determine domain and range of functions in general, including root and rational functions

      d.   Perform arithmetic operations on functions including the composition of functions and the difference quotient.

      e.   Identify and graph linear, absolute value, quadratic, cubic, and square root functions and their transformations.

      f.   Determine and verify inverses of one-to-one functions.

2. Polynomial and Rational Functions
   a. Determine the general and standard forms of quadratic equations
   b. Use formula and complete the square methods to determine the standard form of a quadratic function
   c. Identify intercepts, vertex, and orientation of the parabola and use these to graph quadratic functions
   d. Identify zeros (real-vlaued roots) and complex roots, and determine end behavior of higher order polynomials and graph the polynomial.
   e. Determine if a function demonstrates even or odd symmetry.
   f. Use the Fundamental Theorem of Algebra, Rational Root Test, and Linear Factorization Theorem to factor polynomials and determine the zeros over the complex numbers.
   g. Identify intercepts, end behavior, and asymptotes of rational functions, and graph.
   h. Solve polynomial and rational inequalities.
   i. Interpret the algebraic and graphical meaning of equality of functions and inequality of functions.
   j. Decompose partial fractions.

3. Exponential and Logarithmic Functions
   a. Identify and graph exponential and logarithmic functions and their transformations.
   b. Use properties of logarithms to simplify and expand logarithmic expressions.
   c. Convert between exponential and logarithmic forms and demonstrate and understanding of the relationship between the two forms.
   d. Solve exponential and logarithmic equations using one-to-one and inverse properties.
   e. Solve application problems involving exponential and logarithmic functions.

4. Systems of Equations
   a. Solve three variable linear systems of equations using Gaussian elimination

5. Trigonometric Functions
   a. Identify angles in standard form in both degree and radian format and convert from one to the other.
   b. Find arc length
   c. Find the value of trigonometric functions of common angles without a calculator using the unit circle and right triangle trigonometry
   d. Use reference angles to evaluate trig functions
   e. Find the value of trigonometric functions of angles using a calculator
   f. Use fundamental trigonometric identities to simplify trigonometric expressions. Graph the six trigonometric functions using the amplitude, period, phase and vertical shifts.
   g. Use trig functions to model applications in the life and natural sciences.

6. Analytic Trigonometry
   a. Use the fundamental, quotient, Pythagorean, co-function, and even/odd identities to verify trigonometric identities.
   b. Use the sum and difference, double angle, half angle formulas to evaluate the exact values of trigonometric expressions
   c. Determine exact values of expressions, including composite expressions, involving inverse trigonometric functions.
   d. Solve trigonometric equations over restricted and non-restricted domains

7. Applications of Trigonometry
   a. Solve right triangles and applications involving right triangles
   b. Use Law of Sines and Cosines to solve oblique triangles and applications
   c. Apply concepts of trigonometry to extended topics such as plotting polar coordinates, converting rectangular and polar coordinates from one to the other, identifying vector magnitude and direction,

or performing operations with vectors such as addition, scalar multiplication, component form, and dot product.

8. Conics
    a. Identify conic sections
    b. Write the equations of circles, parabolas, ellipses and hyperbolas in standard form centered both at the origin and not at the origin.
    c. Identify essential characteristics unique to each conic
    d. Graph equations in conic sections, centered both at the origin and not at the origin.
    e. Solve applications involving conic sections.
9. Sequences and Series
    a. Identify the terms of geometric sequences.
    b. Find a particular term of geometric sequences
    c. Determine the formula for the nth term of a geometric sequence
    d. Find the sum of the first n terms of a finite geometric series.
    e. Find the sum of infinite geometric series
    f.

Grading Policy:
Homework and Notebook Checks 20%
Quizzes and Weekly Assignments 30%
Tests and Projects 50%

Grading Scale:
A   90-100
B   80-89
C   70-79
D   60-69
F   below 60

Summative Assessments: There will be two to three Tests over defined
units each grading period. These are announced in advance. Also, student projects
are assigned each semester. Projects have specific objectives and are graded with rubrics.

Formative Assessments: Quizzes to assess student progress on current topics will be announced. Daily work consists of in-class work, notes, and take-home assignments.

Homework:
Students will have homework on a regular basis. This work will always be checked and credit will be given for completion. Homework is primarily for practice which is imperative to your success and progress in this course.

Late work:
 Students are expected to complete assignments and submit them on or before the posted due date. Students will receive a final grade of "Incomplete" until work is submitted. After work is one week late, the original assignment will not be accepted.

Instructional Methods:
Instructional methods shall include but are not limited to direct instruction, instructional discussion, whole class and small group practice, and application based activities.

Attendance: Students are expected to participate through meaningful interactions in the classroom. Attendance will be monitored daily. Keep in mind that poor attendance leads to poor performance.

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ADA Accommodations: Every effort will be made to accommodate students with special needs. Please inform the instructor if you need accommodations not currently provided or if the need arises for any special accommodations.

DCC OPEN COMPUTER LAB & TUTORIAL SERVICES

An open computer lab is available at DCC for student use for work related to course assignments. Personnel are available in the lab if assistance is needed. The lab is located in the DCC Learning Assistance Center (LAC) located in the upper-level of the Whittington W. Clement Learning Resources Center. Check DCC website for tutoring hours. The LAC phone number is 434-797-8404.

The Tutoring Center provides free tutoring for currently enrolled DCC students. Trained peer and professional tutors are available to tutor specific subject areas and to assist students in developing effective learning strategies. The Tutoring Center is located in the upper level of the Learning Resources Center. For more information: **Call at (434) 797-6432 or visit: http://www.dcc.edu/LCR/tutoring/tutoringcenter.htm**

PLAGIARISM/CHEATING

Cheating is the actual or attempted practice of fraudulent or deceptive acts for the purpose of improving one's grade or obtaining course credit; such acts also include assisting another student to do so. Typically, such acts occur in relation to examinations, projects, labs, or graded work. However, it is the intent of this definition that the term "cheating" not be limited to above listed situations only, but that it include any and all actions by a student that are intended to gain an unearned academic advantage by fraudulent or deceptive means. Plagiarism is a specific form of cheating which consists of the misuse of the published and/or unpublished works of others by misrepresenting the material so used as one's own work. Penalties for cheating and plagiarism range from a 0 or F on a particular assignment, through an F for the course, to expulsion from the school/college. Plagiarism can include submitting a paper written by someone else as your own, written by means of inappropriate collaboration, written by you for another course, submitted without the permission of both instructors, purchased, downloaded, or cut and pasted from the Internet, or that fails to properly acknowledge its sources through standard citations.

        A student who receives a failing grade *("F")* in a course as a result of academic dishonesty *(such as plagiarism)* may not withdraw from that course with a "W" or receive a refund. This policy applies to any student in a particular course deemed to have committed an act of academic honesty during any part of a semester, and regardless of whether he/she has turned in any graded work. Mitigating circumstances do not apply in such cases. However, a student may follow the appeal process outlined in the DCC Student Handbook to appeal the failing grade.

STUDENTS WITH SPECIAL NEEDS

"Any student with a disability or other special circumstance requiring academic accommodations or other consideration in order to successfully complete the requirements of this course is requested to identify himself/herself individually to the instructor**." "Danville Community College is committed to meeting the needs of all students and providing access for persons with disabilities. Reasonable accommodations are available to those students with diagnosed disabilities. Students with diagnosed disabilities wishing to receive specific accommodations must be registered with the Disability Services. For more information, please contact the ADA office."**