

Kenneth P. Dietrich School of Arts and Sciences
College in High School

2022-2023

Analytic Geometry and Calculus 1
MATH 0220--4 Credits

Description: This course is the standard first course in calculus for science, engineering, and mathematics students.

Prerequisite: Students are expected to have strong algebra and trigonometry skills. A score of 76 or greater on the ALEKS placement examination is required to register for the CHS credits for this course.

Grading: The student's final grade will not exceed the final exam grade by more than one letter grade.

Textbook: The text used on campus is James Stewart, *Essential Calculus: Early Transcendentals*, 2nd edition (Cengage). However, you may use any textbook that covers the topics listed below.

The following topics are covered in the University of Pittsburgh MATH 0220 course:

1. Functions, limits, continuity, and derivatives

2. Derivative formulas

- Library of functions: polynomial, rational, trigonometric, logarithmic, exponential, hyperbolic
- Limits of algebraic functions, Squeeze Theorem
- Limit definition of the derivative
- Polynomials, products, quotients, Chain Rule, trigonometric functions, inverse functions, exponentials, logs, hyperbolic functions
- Derivatives of inverse functions
- Inverse trigonometric functions and their derivatives
- Logarithmic differentiation
- Motion along a line: position, velocity, acceleration
- Parametric equations

3. First and second derivatives of curves defined parametrically or implicitly

4. Applications of derivatives

- Differentials and linear approximation
- Newton's Method
- Graphing using the 1st and 2nd derivative
- Horizontal and vertical asymptotes
- Optimization
 - The First and Second Derivative Tests
 - Applied optimization problems
- Related rates
- L'Hôpital's Rule
- Motion
- Extrema and the Mean Value Theorem

5. Displacement

6. Integration

- Riemann sums and the definite integral
- Area between curves
- Formal properties: additivity, linearity, triangle inequality
- The Fundamental Theorem of Calculus (both versions)
- Indefinite integrals

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- Recover position from velocity, velocity from acceleration
- Recover a function from its growth rate (derivative) and initial value
- Integration Techniques
- Integration by substitution
- Integration of powers of sines and cosines
- Trigonometric substitution
- Integration by parts
- Integration of rational functions with linear or quadratic denominator

Academic Integrity: All College in High School teachers, students, and their parents/guardians are required to review and be familiar with the University of Pittsburgh's Academic Integrity Policy located online at <https://www.as.pitt.edu/faculty/policies-and-procedures/academic-integrity-code>.

Grades: Grade criteria in the high school course may differ slightly from University of Pittsburgh standards. A CHS student could receive two course grades: one for high school and one for the University transcript. In most cases the grades are the same. These grading standards are explained at the beginning of each course.

Transfer Credit: University of Pittsburgh grades earned in CHS courses appear on an official University of Pittsburgh transcript, and the course credits are likely to be eligible for transfer to other colleges and universities. Students are encouraged to contact potential colleges and universities in advance to ensure their CHS credits would be accepted. If students decide to attend any University of Pittsburgh campuses, the University of Pittsburgh grade earned in the course will count toward the student grade point average at the University. At the University of Pittsburgh, the CHS course supersedes any equivalent AP credit.

Drops and Withdrawals: Students should monitor progress in a course. CHS teacher can obtain a Course Drop/Withdrawal Request form from the CHS office or Aspire. The form must be completed by the student, teacher and parent/guardian and returned to teacher by deadlines listed. Dropping and withdrawing from the CHS course has no effect on enrollment in the high school credits for the course.