Honors Calculus I - Math 1181H Section 110 (Autumn 2017)

Instructor: Maria Angelica Cueto *Email:* cueto.5@osu.edu,
Office: Math Tower (MW) 620, *Phone:* 688-5773.

Office Hours: Mon-Tue-Fr. 10:30am-11:30am in MW 620 (and by appointment if necessary)

Text: G.F. Simmons: *Calculus with Analytic Geometry*, 2nd edition, McGraw-Hill, ISBN: 9780070576424.

Course Description: This course gives an in depth introduction to the concepts and results of differential and integral calculus, as well as infinite series. Focus will be given on understanding why statements are true (i.e. to their proofs) rather than solely on computations.
Calculus is a very old branch of mathematics, with ideas going back at least to Archimedes. We think of calculus being formalized as a subject by Newton (1642-1727) and Leibniz (1646-1716). Since then, it has become part of the basic language of science. Beginning in the 17th century, physical sciences such as Physics and Engineering, were expressed in terms of Calculus. But increasingly, Calculus is the fundamental language of sciences as divers as Biology and Economics. One of the strengths of Calculus, and Mathematics in general, is its ability to describe phenomena in a wide range of subjects by concentrating on their underlying structures, independent of the trapping of the specific field.

Course Topics: We will cover Chapters 2-10 and 12-14 of the textbook (see above).

Prerequisites: 1151 or 151.xx, and permission of department. GE quant reason math and logic course. Not open to students with credit for any higher numbered math class.

Websites: Important class information will be available on the class website and Carmen:
https://people.math.osu.edu/cueto.5/teaching/1181H/Au17 ; https://carmen.osu.edu

Lectures: Mon-Tue-Wed-Thu-Fri 9:10AM-10:05AM in Cockins Hall (CH) 232.

Grading: Your final raw score for this course will be computed using the following weights:

Final Exam (Monday December 11, 10:00AM-11:45AM)	35%
Midterm 1 (Tuesday, Sept 19, in class)	15%
Midterm 2 (Friday, Oct. 20, in class)	15%
Midterm 3 (Tuesday, Nov. 21, in class)	15%
Homework	15%
Quizzes 1-4	5%

Your course letter grade will then be determined based on

1. Your **course percentile** (your relative rank among your peers).
2. My determination of the overall class performance level.

For example, if your final raw score is 70/100 and exactly half of the class has a lower raw score, then your course percentile will be 50%. It is impossible to give the final percentile-to-letter-grade correspondence *a priori*. A reasonable percentile-to-letter-grade **estimate** is the following:

Letter grade	A	A-	B+	B	B-	C+	C	C-	D	E
Percentile range	100-95	95-90	90-87	87-84	84-80	80-77	77-74	74-70	70-60	60-0

If your degree program requires a certain letter grade in this course, it is a good idea to think about the likelihood of you ending up in each of the above ranges early in this semester.

Quizzes: There will be 4 surprise quizzes during the semester, worth 5 points each, consisting of problems very similar to those on the homework assignments. ***Your lowest quiz grade will be dropped***.

Homework: The homework problems are designed to understand the material discussed during the lectures and they will be assigned on a daily basis. There will a total of 14 homeworks, and only selected problems from each set are required to be turned in for grading. The grader will select three problems for grading, each worth 4 points: two points for a correct solution, two points for a good presentation and sufficient explanations. Always justify your answers and calculations!

You are strongly encourage to work out the homework problems in teams, but *individual solutions* must be turned in for grading. **No late homework will be accepted**. **Your two lowest homework grades will be dropped**.

Showing Your Work: Mathematics is not just about deriving the correct numerical solution to a problem. It is also about convincing others that your method of calculation is appropriate. ***Insufficiently supported answers may receive partial or no credit on quizzes and exams.***

Calculators etc.: Calculators, cell phones and other electronic devices **will not be permitted**.

Missed Coursework: No late exams will be accepted without prior written permission. All requests for rescheduling (e.g. due to sickness, athlete duties or unforseen circumstances) must be made in writing at least 48 hours before the regularly scheduled time. Within 48 hours of an exam or quiz only documented legitimate family or medical emergencies will be considered as excuses.

Academic Misconduct Statement: It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term academic misconduct includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-48.7). For additional information, see the Code of Student Conduct at http://studentlife.osu.edu/csc/.

Disability Statement: Students with disabilities that have been certified by Student Life Disabilities Services (SLDS) will be appropriately accommodated and should inform the instructor as soon as possible of their needs. SLDS contact information:slds@osu.edu; 614-292-3307; 098 Baker Hall, 113 W. 12th Avenue.
http://www.ods.osu.edu/

Course topics: We will cover Chapters 2-10 and 12-14 of the textbook (see above). This will include:

Ch. 2 The derivative of a function

2.1 What is Calculus? The problem of tangents.
2.2 How to calculate the slope of a tangent.
2.3 The definition of the derivative.
2.4 Velocity and rates of change.
2.5 The concept of a limit. Two trig. limits.
2.6 Continuous funcs. The Mean Value Theorem.
A2 Theorems about limits.

Ch. 3 The computation of derivatives

3.1 Derivatives of polynomials.
3.2 The product and quotient rules.
3.3 Composite functions and the Chain Rule.
3.4 Some trigonometric derivatives.
3.5 Implicit functions an Fractional exponents.
3.6 Derivatives of higher order.

Ch. 4 Applications of derivatives

4.1 Increasing and decreasing funcs. Max/min.
4.2 Concavity and points of inflection.
4.3 Applied maximum and minimum problems.
4.4 Max-min problems. Reflection and refraction.
4.5 Related rates.

Ch. 5 Definite integrals and differential equations

5.2 Differentials and tange line approximations.
5.3 Indefinite integrals. Substitution.
5.4 Differential eqns. Separation of variables.
5.5 Motion, escape velocity, black holes.

Ch. 6 Definite Integrals

6.2 The problem of areas.
6.3 The Sigma notation and certain special sums.
6.4 The area under a curve. Definite integrals.
6.5 The computation of areas as limits.
6.6 The Fundamental Theorem of Calculus.
6.7 Properties of definite integrals.

Ch. 7 Applications of integration

7.1 The intuitive meaning of integration.
7.2 The area between two curves.
7.3 Volumes: The disk method.
7.4 Volumes: The method of cylindrical shells.
7.5 Arc length.
7.6 The area of a surface of revolution.
7.7 Work and energy.

Ch. 8 Exponential and Logarithmic functions

8.2 Review of exponents and Logarithms.
8.3 The number e and the function $y = e^x$.
8.4 The natural logarithm function $y = \ln x$.
8.5 Popularity growth and radioactive decay.

Ch. 9 Trigonometric functions

9.1 Review of Trigonometry.
9.2 The derivatives of the sine and cosine.
9.3 Integrals of sin and cos. The needle problem.
9.4 The derivatives of the other four functions.
9.5 The inverse trigonometric functions.
9.6 Simple harmonic motion. The Pendulum.

Ch. 10 Methods of integration

10.1 The basic formulas.
10.2 The method of substitution.
10.3 Certain trigonometric integrals.
10.4 Trigonometric substitutions.
10.5 Completing the square.
10.6 The method of partial fractions.
10.7 Integration by parts.
10.8 A mixed bag: Integrals of miscellaneous types.

Ch. 12 Indefinite forms and improper integrals

12.1 The Mean Value Thm (revisited).
12.2 The indeterminate 0/0. L'Hospital's Rule.
12.3 Other indeterminate forms.
12.4 Improper integrals.

Ch. 13 Infinite series of constants

13.1 What is an infinite series?
13.2 Convergent sequences.
13.3 Convergent and divergent series.
13.4 General properties of convergent series.
13.5 Series of nonneg. terms. Comparison tests.
13.6 The integral test. Euler's constant.
13.7 The ratio test and root test.
13.8 The alternating series test. Abs. convergence.
A13 Absolute vs. conditional convergence.
A14 Dirichlet's test.

Ch. 14 Power series

14.2 The interval of convergence.
14.3 Derivatives and integrals of power series.
14.4 Taylor series and Taylor's formula.
14.5 Computations using Taylor's formula.
14.6 Applications to Differential Equations.
14.7 Operations on Power series.
14.8 Complex numbers and Euler's formula.
A15 Uniform convergence for power series.
A16 Division of power series.