Math 221: Calculus & Analytic Geometry 1

Credits: 5 credits

Canvas Course URL: https://canvas.wisc.edu/courses/199509

Meeting Time and Location: Online

Instructional Mode: Math 221-summer 2020 will be delivered remotely. This course is asynchronous. The pre-recorded lecture videos will be posted on Canvas before 10 am each lecture days: M, T, W, TH.

INSTRUCTORS AND TEACHING ASSISTANTS

Liang Kong, Associate Professor

Instructor Availability: MW 5:00-6:00PM (email me to make an appointment)

Instructor Email/Preferred Contact: kong45@wisc.edu

Teaching Assistant: KRENZ, Andrew (krenz3@wisc.edu); KRISTENSEN, Kevin (kckristensen@wisc.edu); LI, Nianzi (nli62@wisc.edu); YAO, Liding (lyao26@wisc.edu)

TA Office Hours: Please contact your TA for the office hours

OFFICIAL COURSE DESCRIPTION

Background and Goals:
This course covers differential and integral calculus, plane analytic geometry, applications; transcendental functions, etc. The Math 221-222 sequence is the first two semesters of the standard three-semester calculus sequence, completed with 234, which is normally required for all higher-level math courses and should be taken by those preparing for major study in mathematics, the physical sciences, computer sciences, or engineering. It is also recommended for students in the social and life sciences who may want a more substantial introduction to calculus than is offered in the Math 211-213 sequence.

Requisites
Math 114 or (Math 112 and 113) or placement into Math 221.
Math 211 or Math 213 does not fulfill the requisite.
LEARNING OUTCOMES

- Become a competent user of differential calculus
- Develop problem-solving skills, especially in formulating verbal descriptions as mathematical problems and in constructing long, multi-step solutions
- Develop ability to write well-organized, coherent solutions to problems
- Understand the concept of derivative as representing rate of change and slope
- Know basic differentiation formulas and rules and be adept at computing derivatives of elementary functions symbolically
- Understand the concept of definite integral, especially as representing area and distance, and to be able to approximate a definite integral by Riemann sums

GUIDELINES FOR SUCCESS

Time Commitment
As you begin this course, you would be wise to schedule 8 or more hours per week for studying materials and completing assignments. Falling behind in this course is particularly problematic because the concepts we cover are cumulative. This means that not becoming proficient with information and objectives presented and assessed in a particular week can lead to low scores for that week as well as in subsequent weeks.

REQUIRED TEXTBOOK, SOFTWARE & OTHER COURSE MATERIALS

- James Stewart. Calculus (8th ed.) E-book
- WebAssign

HOMEWORK & OTHER ASSIGNMENTS

- Homework will be assigned weekly on WebAssign

OUTLINE OF TOPICS:

- Coordinates, lines, circles
- Functions and graphing, trig functions
- Limits, intuitively and with an idea of how they can be formalized, including limits at infinity and infinite limits, trig limits
- Derivatives, Chain rule, Leibniz notation, higher order derivatives, implicit differentiation, related rates, approximations
- Applications of the derivative
- Antiderivatives, indefinite integrals and introduction to differential equations
- Sums, areas and the definite integral. Fundamental Theorem of Calculus.
- Integration by substitution, applications of the integral: areas and volumes.
- Transcendental functions, limits involving logs, exp and powers. Optional: Hyperbolics functions.

EXAMS
There will be three midterm exams and a FINAL. The final exam will be cumulative and comprehensive. If I am contacted with an acceptable/documented excuse (before the date of
the exam) then you may take a makeup exam. All exams, including Final, are held at the regular class meeting, 8:55-10:10 am.

- Exam 1 (06/25)
- Exam 2 (07/09)
- Exam 3 (07/23)
- Final Exam (08/06)

ASSIGNMENTS AND WEIGHTS
Your overall course grade will be based on homework and 4 exams listed above, as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Homework</td>
<td>30%</td>
</tr>
<tr>
<td>Three in-class Exams</td>
<td>45% (15% each)</td>
</tr>
<tr>
<td>Final Exam</td>
<td>25%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100%</td>
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</table>

LETTER GRADE
Your total scores will be rounded up (by up to .99%), and fit on the following curve:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>90%</td>
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<tr>
<td>AB</td>
<td>86%</td>
</tr>
<tr>
<td>B</td>
<td>80%</td>
</tr>
<tr>
<td>BC</td>
<td>76%</td>
</tr>
<tr>
<td>C</td>
<td>70%</td>
</tr>
<tr>
<td>D</td>
<td>60%</td>
</tr>
<tr>
<td>F</td>
<td>less than 60%</td>
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RULES, RIGHTS & RESPONSIBILITIES
- See the Guide’s to [Rules, Rights and Responsibilities](#)

ACADEMIC INTEGRITY
By enrolling in this course, each student assumes the responsibilities of an active participant in UW-Madison’s community of scholars in which everyone’s academic work and behavior are held to the highest academic integrity standards. Academic misconduct compromises the integrity of the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these acts are examples of academic misconduct, which can result in disciplinary action. This includes but is not limited to failure on the assignment/course, disciplinary probation, or suspension. Substantial or repeated cases of misconduct will be forwarded to the Office of Student Conduct & Community Standards for additional review. For more information, refer to [studentconduct.wiscweb.wisc.edu/academic-integrity/](#).

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES
The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State
Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA. http://mcburney.wisc.edu/facstaffother/faculty/syllabus.php

DIVERSITY & INCLUSION

Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.

The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world. https://diversity.wisc.edu/

Subject to Change Statement

This syllabus is subject to change at the discretion of the instructor to accommodate instructional and/or student needs. If a major change is made, students will be notified well in advance.
<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Assignments due*</th>
</tr>
</thead>
</table>
| 1    | 1.1, 1.5 Preview and Functions; The Limit of a Function (Monday)  
1.6, 1.7 Calculating Limits Using the Limit Laws; The Precise Definition of a Limit (Tuesday)  
1.8 Continuity (Wednesday)  
2.1 Derivatives and Rates of Change (Thursday) | Homework dues at 11:59 pm each Sundays, with the exception of Week 8.  
June 21, 2020 |
| 2    | 2.2 The Derivative as a Function (M)  
2.3 Differentiation Formulas (T)  
2.4 Derivatives of Trigonometric Functions (W) | June 28, 2020 |
| 3    | 2.5 The Chain Rule (M)  
2.6 Implicit Differentiation (T)  
3.1 Maximum and Minimum Values (W, Th) | July 5, 2020 |
| 4    | 3.2 The Mean Value Theorem (M)  
3.3 How Derivatives Affect the Shape of a Graph (T)  
3.4 Limits at Infinity; Horizontal Asymptotes; Curve Sketching (W) | July 12, 2020 |
| 5    | 3.7, 3.9 Applied Optimization & Antiderivatives (M)  
4.1 Areas and Distances (T)  
4.2 The Definite Integral (W)  
4.3 The Fundamental Theorem of Calculus (Th) | July 19, 2020 |

Exam 1: Jun 25, 2020. *(Exam time: 8:55-10:10 am), (Upload time: 10:10-10:30 am)*

Exam 2: July 9, 2020. *(Exam time: 8:55-10:10 am), (Upload time: 10:10-10:30 am)*
<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
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</table>
| 6    | 4.4 Indefinite Integrals and the Net Change Theorem (M)  
4.5 The Substitution Rule (T)  
6.1 Inverse Functions (summary) (W)  
**Exam 3: July 23, 2020. (Exam time: 8:55-10:10 am), (Upload time: 10:10-10:30 am)** |
| 7    | 6.2 Exponential Functions and their Derivatives (M)  
6.3 Logarithmic Functions (T)  
6.4 Derivatives of Logarithmic Functions (W)  
6.6 Inverse Trigonometric Functions (Th) |
| 8    | 6.8 Indeterminate Forms and L’Hôpital’s Rule (continued) (M)  
5.1, 5.5 Areas Between Curves; Average Value of a Function (T)  
5.2, 5.3 Volumes (W)  
**Final Exam: August 6, 2020. (Exam time: 8:55-10:10 am), (Upload time: 10:10-10:30 am)** |
|      | **July 26, 2020** |
|      | **August 2, 2020** |
|      | **Aug 6, 2020 (8:00 am)** |