Agnes Scott College

# Calculus I Syllabus

**Spring 2017**

**Course:** MAT-118-A (13956) MWF 8:15 – 9:20 a.m. Bullock Science Center, Room 103W
**Credit hours:** 4
**Prerequisites:** None
**Co-requisites:** None

A good rule of thumb for time management planning for the course is to set aside two hours outside of class for studying and working on assignments for each hour spent in class, adjusted up or down as determined by your own individual needs.

**Instructor:** Mr. Robert Pruvenok
E-mail: rpruvenok@agnesscott.edu (preferred contact method aside from in-person)
Phone: 678-240-6222
Office: Buttrick 333

**Office Hours:**
No appointment is needed to see me during the following times:
MWF 7:00 – 8:00 a.m. and 9:30 – 10:30 a.m. in Buttrick 333 (Math Department Office)
(or by appointment)

**Learning Assistant:** Kira Fritsche (kfritsche@agnesscott.edu)

**Workshops:** Sunday (7 p.m.) (see details below with the homework exercises)
Monday (8 p.m.)

**Required Materials:**
- Textbook: *Calculus, Single Variable, 4th* ed.; by Hughes-Hallett, et al., Wiley Publishing
- TI-83/84 or equivalent graphing calculator (no computer algebra systems)

**Course Description**:
Introduction to the basic concepts of differential and integral calculus, emphasizing conceptual understanding and applications. Topics are covered from a graphical, algebraic and numerical perspective. Mathematical writing is emphasized. A graphing calculator is required for this course.

**Background Knowledge:**
Algebraic and graphical familiarity with polynomial, rational, radical, piecewise, trigonometric, inverse trigonometric, exponential and logarithmic functions is required, though will be reviewed as necessary during the semester.

**Course Content:**
Chapters 1-6 of the text. Topics include limits, continuity, differentiability, techniques of differentiation, optimization and definite integrals.

**Course Goals:**
By the end of the semester, you should:
1. Become proficient with computing derivatives.
2. Appreciate that problems allow for numerous approaches, for example graphical, numerical and analytical.
3. Use calculus to answer otherwise difficult questions such as solving optimization problems.
4. Develop an understanding and intuition of limits, and more generally develop an appreciation for "local" phenomena.
5. Learn a group approach to problem solving.

**Overview of Calculus:**
Calculus identifies common properties of the "elementary" functions (polynomial, rational, radical, trigonometric, inverse trigonometric, exponential and logarithmic, with arithmetic operations and compositions) and unites them via the concepts of limits and continuity. Calculus was discovered several centuries ago by Newton and Liebniz independently and is a powerful mathematical tool for studying various types of:

1. rates of change (studied with the differential calculus)
2. accumulations (studied with the integral calculus)

An illustrative example is snow. From a simplified physical standpoint, the rate of snowfall (heavy vs. light) and the rate of melting (from above via warm air or below via warm ground) together over time determine how much snow accumulation is present at any one specific time. The snowfall and melting rates are governed mathematically by the differential calculus and the accumulation by the integral calculus, both of which are intuitively linked in this example. In other contexts, the relationship between derivatives and integrals can be far from intuitive, but the mathematics of these relationships will be studied later in the course.

Calculus has numerous applications in various sciences, examples of which we will study during the course, including physics, finance, population dynamics, chemistry and economics.

**Expectations:**

- Attend every class on time and for the full class period. While attendance and tardiness do not directly impact your grade (with exception of exams), good attendance correlates with good academic performance and tardiness is stressful to you as well as distracting to your classmates.
- Participate in class, including asking questions and answering questions asked.
- Be attentive. courteous and respectful of your classmates (no texting, crinkly potato chip bags, etc.).
- Complete all graded and ungraded homework before the next class so you can understand new material.

**Graded Assignments:**
Your course average will be a weighted average of the following 5 types of graded assignments. Late assignment submissions will receive a grade of zero unless stated otherwise.

- ***Homework* (15%)**: All graded homework assignments will be completed online through WeBWorK (webwork.agnesscott.edu). Additional homework questions, all of which are expected to be completed, are listed below.
- ***Projects* (20%)**: Three projects will be assigned during the semester highlighting real-world applications of the course. Project assignments will be posted in Moodle and due dates are listed in the schedule of class meeting dates below.
- ***Differentiation Proficiency Test* (5%)**: All Calculus I students will be expected to pass a Differentiation Proficiency Test given on WeBWorK. This test will consist of computing various derivatives (Chapter 3) and ALL questions must be answered correctly to earn a "passing" grade. The deadline for passing the Differentiation Proficiency Test is listed in the schedule of class meeting dates below.
- ***Exams* (40%)**: You will have 3 exams to be completed in class on the dates listed in the schedule of class meeting dates below.
- ***Final Exam* (20%)**: The final exam is cumulative, although there will be more material from after the last exam since it will not have been assessed on its own exam. The Final Exam will be self-scheduled.

**Grading Scale:**
Your course letter grade will be determine by your course average according to the following scale.

| | | | | |
|---|---|---|---|---|
| | **B+ 88 – 89** | **C+ 78 – 79** | **D+ 68 – 69** | |
| **A 92 – 100+** | **B 82 – 87** | **C 72 – 77** | **D 62 – 67** | **F 0 – 59** |
| **A– 90 – 91** | **B– 80 – 81** | **C– 70 – 71** | **D– 60 – 61** | |

*This schedule is subject to change at the instructor's discretion.*

| DATE | TOPIC |
|---|---|
| **W–Jan 11** | 1.7 Introduction to Continuity |
| **F-Jan 13** | 1.8 Limits |
| **M-Jan 16** | **MLK HOLIDAY – NO CLASSES** |
| **W-Jan 18** | 1.8 Limits |
| **F- Jan 20** | 2.1 How Do We Measure Speed? |
| **M-Jan 23** | 2.2 The Derivative at a Point |
| **W-Jan 25** | 2.3 The Derivative Function |
| **F-Jan 27** | 2.4 Interpretations of the Derivative |
| **M-Jan 30** | 2.5 The Second Derivative |
| **W-Feb 1** | 2.6 Differentiability |
| **F-Feb 3** | **Exam 1** |
| **M-Feb 6** | 3.1 Powers and Polynomials |
| **W-Feb 8** | 3.2 The Exponential Function |
| **F-Feb 10** | 3.3 The Product and Quotient Rules, **Project 1 due** |
| **M-Feb 13** | 3.4 The Chain Rule |
| **W-Feb 15** | 3.5 The Trigonometric Functions |
| **F-Feb 17** | 3.6 The Chain Rule and Inverse Functions |
| **M-Feb 20** | 3.7 Implicit Functions |
| **W-Feb 22** | 3.9 Linear Approximation and the Derivative |
| **F-Feb 24** | 3.10 Theorems About Differentiable Functions |
| **M-Feb 27** | **Exam 2** |
| **W-Mar 1** | 4.1 Using First and Second Derivatives |
| **F–Mar 3** | 4.1 Using First and Second Derivatives |
| **MWF-Mar 6, 8, 10** | **PEAK WEEK – NO CLASSES** |
| **MWF-Mar 13, 15, 17** | **SPRING BREAK – NO CLASSES** |
| **M-Mar 20** | 4.3 Optimization |
| **W-Mar 22** | 4.3 Optimization |
| **F-Mar 24** | 4.4 Applications to Marginality, **Project 2 due** |
| **M-Mar 27** | 4.5 Optimization and Modeling |
| **W-Mar 29** | 4.5 Optimization and Modeling |
| **F-Mar 31** | 4.6 Rates and Related Rates |
| **M-April 3** | 4.6 Rates and Related Rates, **Differentiation Proficiency Test Due** |
| **W-April 5** | 4.7 L'Hopital's Rule, Growth, and Dominance |
| **F-April 7** | 4.8 Parametric Equations |
| **M-April 10** | **Exam 3** |
| **W-April 12** | 5.1 How Do We Measure Distance Traveled? |
| **F-April 14** | **GOOD FRIDAY – NO CLASSES** |
| **M-April 17** | 5.2 The Definite Integral |
| **W-April 19** | 5.3 The Fundamental Theorem and Interpretations |
| **F-April 21** | 5.3 The Fundamental Theorem and Interpretations, **Project 3 due** |
| **M-April 24** | 5.4 Theorems About Definite Integrals |
| **W-April 26** | 6.1 Antiderivatives Graphically and Numerically |
| **F-April 28** | 6.2 Constructing Antiderivatives Analytically |
| **M-May 1** | 6.3 Differential Equations,<br>6.5 The Equations of Motion |
| **W-May 3** | 6.4 Second Fundamental Theorem of Calculus<br>**LAST DAY OF CLASSES** |
| **Saturday, May 13** | **COMMENCEMENT** |

**Workshops:**
There will be weekly workshops beginning on Sunday 1/22/17, conducted by Kira Fritsche (kfritsche@agnesscott.edu), one of the Learning Assistants for the course. There will be two workshops per week, one on Sunday at 7 p.m. and the other on Monday at 8 p.m.

For each workshop that you **actively participate** in, you will receive a bonus point which will be applied on the next exam. Active participation requires that you 1) arrive before the start of the workshop, 2) stay for the entire workshop, 3) bring your textbook, 4) pay attention and 5) complete or at least attempt the homework in advance. Attendance will be taken by the leaders of the workshops and your attendance record will be available in the Moodle gradebook.

**Homework exercises:**
Graded homeworks are to be completed in WeBWorK, the specific textbook exercises for which are shown within the WeBWorK assignments. This list includes ungraded exercises that you are responsible for understanding.

| DUE DATE | SECTION # | EXERCISES (These may also include background material from Chapter 1.) |
|---|---|---|
| **W-Jan 18** | 1.7 | p. 47 #1, 9, 13, 15 |
| **W-Jan 25** | 1.8 | p. 55 #1, 3, 11, 15, 27, 28, 37 |
| | 2.1 | p. 71 #1-14, 19 |
| **W-Feb 1** | 2.2 | p. 78 #1, 5, 8, 9, 11, 12, 15, 17, 27, 34, 35, 40 |
| | 2.3 | p. 86 #1-11, 14, 17, 21-23, 33-39, 42 |
| | 2.4 | p. 91 #1-19 |
| **F-Feb 3** | 2.5 | p. 97 #1-12, 14-23 |
| **(Exam 1)** | 2.6 | p. 101 #1-8, 11, 13, 17 |
| **W-Feb 15** | 3.1 | p. 115 #1-43, 52, 54, 59-67 |
| | 3.2 | p. 14 #13; p. 120 #1-11, 15-43 |
| | 3.3 | p. 124 #1-33, 44-47, 50-55, 61 |
| **W-Feb 22** | 3.4 | p. 130 #1-55, 58, 61, 63, 64, 67, 72, 81, 83 |
| | 3.5 | p. 35 #14, 16, 30, 35, 38, 39, 41; p. 136 #3-41, 44, 45, 47 |
| | 3.6 | p. 27 #8, 12, 36, 38, 40; p. 141 #1-41, 44, 52, 55-57, 61, 63 |
| **M-Feb 27** | 3.7 | p. 145 #1-29, 33, 35 |
| | 3.9 | p. 154 #1-9, 21, 25 |
| **(Exam 2)** | 3.10 | p. 158 #1-9, 13, 18 |
| **W-Mar 22** | 4.1 | p. 172 #1-11, 17, 21, 23, 27, 28, 31, 33, 43-47 |
| **W-Mar 29** | 4.3 | p. 186 #1-13, 19-22, 25, 28, 29, 35, 41 |
| | 4.4 | p. 195 #1-17 |
| **W-April 5** | 4.5 | p. 202 #1-14, 16-21, 24, 25, 35, 39 |
| **M-April 10** | 4.6 | p. 210 #1-13, 16-18, 20, 24, 27, 28, 31, 35 |
| | 4.7 | p. 218 #1-21, 27 |
| **(Exam 3)** | 4.8 | p. 226 #1-23, 27, 35, 39 |
| **W-April 19** | 5.1 | p. 246 #1-9, 15-25 |
| **W-April 26** | 5.2 | p. 253 #1, 3, 4, 7, 11, 16, 18, 19, 21, 25-29 |
| | 5.3 | p. 261 #1-13, 17, 21, 29, 35 |
| **W-May 3** | 5.4 | p. 270 #3, 7, 11-23, 27-31, 35, 41 |
| | 6.1 | p. 285 #1, 3, 7-17, 21, 23 |
| | 6.2 | p. 292 #1-73, 81, 87 |
| | 6.3 | p. 297 #1-11, 13-20 |
| | 6.4 | p. 302 #1-10, 15-19 |
| | 6.5 | p. 305 #1-7 |

**Academic Honesty:**
The Agnes Scott College honor code embodies an ideal of character, conduct, and citizenship, and is an important part of the College's mission and core identity. This applies especially to academic honesty and integrity. Passing off someone else's work as your own represents intellectual fraud and theft, and violates the core values of our academic community. To be honorable, you should understand not only what counts as academic dishonesty, but also how to avoid engaging in these practices.

You should:

- Review this course syllabus for the professor's expectations regarding course work and class attendance.
- Attribute all ideas taken from other sources; this shows respect for other scholars. Plagiarism can include portraying another's work or ideas as your own, buying a paper online and turning it in as if it were your own work, or not citing or improperly citing references on a reference page or within the text of a paper.
- Not falsify or create data and resources or alter a graded work without the prior consent of your professor. This included making up a reference for a works cited page or making up statistics or facts for academic work.
- Not allow another party to do your work/exam, or submit the same or similar work in more than one course without permission from the course instructors. Cheating also includes taking an exam for another person, looking on another person's exam for answers, using exams from previous classes without permission, or bringing and using unauthorized notes or resources (i.e., electronic, written, or otherwise) during an exam.
- Not facilitate cheating, which can happen when you help another student complete a take home exam, give answers to an exam, talk about an exam with a student who has not taken it, or collaborate with others on work that is supposed to be completed independently.
- Be truthful about the submission fo work, which includes the time of submission and the place of submission (e.g., e-mail, online, in a mailbox, to an office, etc.).

You should understand that penalties result from dishonest conduct, ranging from failure of the assignment to expulsion from the college. You should speak with me if you need clarification about any of these policies.

**Accommodations for Students with Disabilities:**
Agnes Scott College seeks to provide equal access to its programs, services and activities for people with various abilities. If you will need accommodations in this course, please contact Kelly Roy in the Office of Academic Advising and Accessible Education (404-471-6174, Buttrick Hall G-13A) to complete the registration process. Once registered, please contact me so we can discuss the specific accommodations needed for this course.

**Title IX Information:**
For the safety of the entire community, if you have experienced or have any information about sexual misconduct, the college strongly urges you to immediately report such information to Title IX Coordinator Marti Fessenden (mfessenden@agnesscott.edu, 404-471-6547), Vice President for Student Affairs and Dean of Students Karen Goff (kgoff@agnesscott.edu, 404-471-6449), or Deputy Title IX Coordinator Karen Gilbert (kgilbert@agnesscott.edu, 404-471-6435).

**Course Evaluations:**
Your constructive assessment of this course plays an indispensable role in shaping education at Agnes Scott College. Upon completing the course, please take the time to fill out the online course evaluation.