MAA 5104/4102 Advanced Calculus I (E and PS) 1

Instructor: Sergei S. Pilyugin
http://people.clas.ufl.edu/pilyugin/courses/maa5104()

**Announcements:** All relevant announcements will be posted here. There are no current announcements.

The take-home midterms are scheduled as follows: M1 9/28–9/30, M2 11/16–11/18. The quizzes are scheduled as follows: Q1 9/16, Q2 10/17, Q3 11/09, Q4 12/23.

**Prerequisites:** MAC 2313 (Calculus 3).

**Time and Room:** MWF 5 (11:45 a.m. – 12:35 p.m.), LIT 127.

**Final Exam Time and Room:** To be announced.


**Critical dates:** Aug. 22 (classes begin), Dec. 7 (classes end); Quizzes: Q1 9/16, Q2 10/07, Q3 11/09, Q4 12/23.


**Midterm Exam, Sep. 05 (Labor Day), Oct. 14–15 Homecoming, Nov. 11 (Veterans Day), Nov. 23–26 (Thanksgiving).**

**Office Hours:** MWF 10-11:30 a.m. in LIT 408, or by appointment. Please, call me at 352-294-2326 or e-mail: pilyugin@ufl.edu for communication. For more details, see my schedule.

**Description and Objectives of the Course:**

What is the difference between the advanced calculus course and the calculus courses that you have taken? In the current course, we will revisit the same concepts as before (real numbers, sequences, functions, limits, continuity, differentiability, integration, etc), but we will treat them in a more accurate and rigorous way. So, the main difference is that we have

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**Weekly Schedule:**

**W1:** Proof techniques, mathematical induction;

**W2:** Ordered fields and the real number system, basic inequalities;

**W3:** Sequences, convergence, finite limits, monotone sequences;

**W4:** Cauchy sequences, subsequences;

**W5:** Applications of limits, transcendental number e;

**W6:** Limits of functions, sided limits;

**W7:** Continuity, properties of continuous functions;

**W8:** Uniform continuity;

**W9:** Applications of continuity, compact sets;

**W10:** Derivatives, properties of differentiable functions;

**W11:** Mean value theorems;

**W12:** Higher-order derivatives, L'Hopital's rule;

**W13:** Taylor's theorem and applications;

**W14:** Approximation of derivatives, convex functions.

**Grading System:**

Exams: 2 midterms (20 points each, possibly take-home); 1 (cumulative) final (30 points). Four quizzes based on homework assignments. You may take 10 points for each quiz; the best 3 count towards the grade. So, 30 points for Quizzes, 20 points for each Midterm Exam, 30 points for Final Exam, and 100 points altogether. The resulting score determines the letter grade according to the following table.

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<th>B+</th>
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**Course policies:**

**Coursebook policy:** No use of calculators, or books will be allowed during any in-class tests/quizzes.

Policy related to make-up exams or other work: There will be no opportunities to make up work not submitted. However, if a student provides a legitimate excuse in advance, a change of due date may be arranged. Work with due date should be turned in at the beginning of class on the stated due date. Late work will not be accepted and will be deemed work not submitted.

Policy on class attendance: Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found in the online catalog at: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx.

University's honesty policy: UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by adhering to the Honor Code."

Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at: https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results.

**Disclaimer:** I reserve the right to change the above policies if situations warrant.

**Homework problems for Advanced Calculus I Fall 2016**

Section 1.3: 2, 3, 5;

Section 1.4: 1, 2, 4, 5;

Section 1.7: 1, 3, 5, 11, 13–16;

Section 1.9: 13–17, 28–29, 32–34;

Section 2.1: 2, 3, 5, 7, 10, 12, 14–17, 19–21;

Section 2.2: 3, 8, 11, 15–17, 19, 21;

Section 2.3: 2, 5, 8, 10, 11, 14, 16;

Section 2.4: 4–5, 9, 11, 13–16, 17;

Section 2.5: 2, 3, 5–7, 11, 15, 17–19;

Section 2.6: 2, 4, 5, 7, 9;

Section 2.7: 1–4, 6–8, 12–15, 22, 27, 28, 30–32, 35, 39, 42, 43, 45, 48, 50;

Section 3.1: 4, 5, 7, 8, 10, 11, 15;

Section 3.2: 1, 3, 8, 9, 13, 15;
Section 3.2: 1, 3, 8, 9, 13, 15;
Section 3.3: 4, 5, 8, 9, 10, 12, 13, 15;
Section 3.4: 1--7, 15, 17, 23, 24, 26, 41--43;
Section 4.1: 1, 2, 3, 5, 6, 9, 10;
Section 4.3: 1, 3, 7, 13, 14, 17, 18;
Section 4.4: 1, 2, 5, 10, 12, 13;
Section 5.1: 2, 3, 6, 7, 9--12, 15;
Section 5.2: 1, 3, 6, 7, 12, 13;
Section 5.3: 1, 2, 4, 6, 7, 9--11, 15, 17, 19, 21, 27, 29;
Section 5.4: 2, 5, 8--10, 21--23, 27, 28, 30;
Section 5.6: 2, 4, 7, 9, 10, 15, 16, 22, 25, 35, 41, 51, 52;

For the final exam (Chapters 1--5):

Theorems to know (with proof):
- Binomial theorem 1.3.7
- Theorem 1.7.10 (sets Q and I are dense in R)
- Theorem 2.1.11 (convergent sequences are bounded)
- Theorem 2.2.6 (sequences for sequences)
- Theorem 2.3.7 (ratio test)
- Theorem 2.4.4 (monotone sequences)
- Theorem 2.5.4 (Bolzano-Weierstrass for sets)
- Theorem 2.5.9 (Cauchy=convergent)
- Theorem 2.6.4 (Bolzano-Weierstrass for sequences)
- Theorem 4.3.5 (extreme value)
- Theorem 4.3.6 (Intermediate value)
- Theorem 4.4.6 (continuous on closed bdd set=> unif. continuous)
- Theorem 5.3.1 (Rolle's theorem)
- Theorem 5.3.3 (Lagrange's Mean Value theorem)

Definitions:
- Limit of a sequence
- Inf/Sup/Min/Max of a set
- Accumulation point
- Sided limits
- Limits at infinity
- Infinite limits
- Continuity
- Uniform continuity
- Derivative of a function

Homework problems for Advanced Calculus II Spring 2016

Section 5.3: 1, 2, 4, 6, 7, 9--11, 15, 17, 19, 21, 27, 29;
Section 5.4: 2, 5, 8--10, 21--23, 27, 28, 30;
Section 5.5: 1, 6--8, 12, 13, 15;
Section 5.6: 2, 4, 7, 9, 10, 15, 19, 22, 25, 35, 41, 51, 52;
Section 6.1: 3, 4, 6, 8, 10;
Section 6.2: 1, 2, 5--8, 10, 11, 13, 14;
Section 6.3: 2, 4, 8, 11, 13, 14;
Section 6.4: 7, 10, 11, 13, 14, 18, 22;
Section 6.5: 9, 10, 16, 17, 20, 24;
Section 6.7: 1, 2, 9, 6, 11, 21, 22, 28, 29, 31;
Section 7.1: 1--5, 9, 10, 14, 16, 18;
Section 7.2: 1, 2, 5, 6, 9, 11, 13--15;
Section 7.3: 1, 2, 4, 7, 9, 13, 16, 19;
Section 7.4: 1, 2, 4, 5--8, 10, 11, 16, 20;
Section 7.5: 1--7, 9--16, 19, 21, 23--28, 34, 36--38, 41;
Section 8.1: 1, 2, 4, 5;
Section 8.2: 1--5, 6;
Section 8.3: 1, 5, 8, 11;
Section 8.4: 1, 2, 4, 6, 8, 9, 11, 12, 15, 18, 21;
Section 8.5: 2, 3, 4, 6, 10, 13;

For the final exam, you will need to review the following
Theorems/Lemmas (statements and proofs): 5.3.1, 5.3.3, 5.4.8,
6.1.5, 6.2.2, 6.2.4, 6.3.3, 6.3.8, 6.3.10, 6.4.2, 6.4.4, 7.2.1,
7.2.10, 7.3.3, 7.4.2, 8.3.1, 8.3.5, 8.3.8,
(statements only): 6.5.16, 6.5.17, 7.6.2, 7.6.10, 8.3.6, 8.3.7,
8.4.4, 8.4.11, 8.4.13, 8.4.14, 8.4.15;
Definitions (with examples and counterexamples): Taylor's polynomial, Riemann integrable functions, Riemann integrals, improper Riemann integral, absolute and conditional convergence of series, pointwise and uniform convergence, power series, radius and interval of convergence.

Definitions: Limit of a sequence, Inf/Sup/Min/Max of a set, Accumulation point, Limit at infinity, Infinite limits, Continuity, Uniform continuity, Derivative of a function.