Math 141H, Section 001
Spring 2015

Instructor: Dr. Jessica M. Conway

Office: 332 McAllister Building

Email: jmconway@psu.edu

Section website: on ANGEL (https://cms.psu.edu/) + http://jmconway.org/Math141H/Math141H_Sp15.html

Office hours: Mondays 3:30-5:30pm, Fridays 12:30-1:30 + by appointment

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MATH 141H (GQ) Honors Calculus with Analytic Geometry II (4) Honors course in derivatives, integrals, applications; sequences and series; analytic geometry; polar coordinates. Students may take only one course for credit from MATH 141, 141B, and 141H.

Prerequisites: MATH 140, MATH 140A, MATH 140B or MATH 140H.

Textbook: Calculus (Single Variable), Seventh Edition, (OR) Calculus, Seventh Edition, by James Stewart, published by Thomson (Brooks/Cole). Alternatives to purchasing: an electronic version of the text (e-text) is available chapter by chapter (google or see course website for link), or the text can be rented from amazon.

Additional materials: We will be using MATLAB for numerical computations, available for free as a WebApp at https://webapps.psu.edu/. Alternatively you may use the software of your choice, for example Python, Julia, Octave, R, etc.

Course format: There are four 50-minute lectures each week.

Math 141H learning objectives: Upon successful completion of Math 141H, the student should be able to

General Math 141 learning objectives:

1. Differentiate exponential, logarithmic, and inverse trigonometric functions.
2. Integrate exponential, logarithmic, and inverse trigonometric functions.
3. Recognize integrands for which integration by parts is appropriate.
4. Use the formula to integrate by parts.
5. Use techniques for integrals of products of sines and cosines.
6. Use techniques for integrals of secants and tangents, and for cosecants and cotangents.
7. Use techniques of trigonometric substitution to integrate various forms of integrands.
8. Complete the square to express an irreducible quadratic polynomial as a sum or difference of squares.
9. Perform polynomial long division to reduce an integrand to a more easily integrated form.
10. Use the technique of partial fraction decomposition to reduce an integrand to a more easily integrated form.
11. Given a random integration problem, choose the proper method and proceed with integration.
12. Identify indeterminate limit forms.
13. Evaluate limits using L'Hospital's Rule.
14. Recognize improper integrals and put in proper form for determination.
15. Determine if an improper integral diverges or converges (and if so, to what?).
16. Identify and compare different types of sequences.
17. Determine if a sequence diverges or converges (and if so, to what?).
18. Recognize famous series in standard and non-standard form.
19. Apply infinite series tests for convergence and divergence.
20. Determine the error associated with a partial sum of an alternating series.
21. Find the interval of convergence and radius of convergence for a given power series.
22. Generate power series representations of some functions from a geometric series perspective.
23. Generate power series representations of some functions from a Taylor Series perspective.
24. Recognize and manipulate important Maclaurin Series (e^x, $\sin x$, $\cos x$, $\tan^{-1} x$, $1/(1-x)$) by differentiation, integration, and substitution.

25. Find the n^{th} degree Taylor Polynomial of a function f at a point a and determine the error associated with the estimate.
26. Sketch graphs of curves defined parametrically.
27. Use calculus techniques to analyze the behavior of graphs of parametrically defined curves.
28. Sketch graphs of polar equations.
29. Find points of intersection of two or more polar functions.
30. Find slopes of tangents to polar-defined curves.
31. Find areas enclosed by polar-defined curves.
32. Synthesize concepts from two or more separate sections of the text.

Math 141H-specific learning objectives:

1. Use semi-log and loglog plots to evaluate types of growth.
2. Integrate arbitrary functions numerically, using for example the midpoint, trapezoidal, or Simpson's rule, using Matlab.
3. Evaluate errors of numerical integration methods via Taylor series expansions.

Calculators: NO calculators are allowed on quizzes, midterms, or on the final examination.

Examinations: There will be three in-class midterm examinations and a final examination.

Midterm #1, Friday February 13 (date subject to change).

Midterm #2, Friday April 3 (date subject to change).

Final Exam, week of May 4, date, time, and location TBA.

Make-up midterm examinations: Students who have a valid documented reason, such as illness, during examination times are permitted to schedule a makeup examination with no penalty. You must be prepared to verify the reason for taking the makeup. Personal business, such as travel, employment, weddings, graduations, or attendance at public events such as concerts, sporting events, and Greek Rush events, is not a valid excuse.
Make-up examinations are scheduled outside of class time at the instructor's discretion.
Note: If you miss an exam without an official excuse (such as illness or official university business), you may be allowed to take a makeup exam, but with an automatic 25% deduction from the grade. To avoid this deduction, you must notify your instructor with your official excuse, before the date and time of the exam. This notification may be performed in person, via e-mail, or by telephone.

Final examination: : The final examination will be given during the week of May 4 – May 8, 2015. Students may access their final exam schedules Monday, February 17, through their e-lion accounts. Notification of conflicts is given on the student's final exam schedule. A student must take action to request a conflict exam through e-lion between February 16 and March 8. Conflict final examinations cannot be scheduled through the instructor or the mathematics department.

Late drop: Students may add/drop a course without academic penalty within the first ten calendar days of the semester. A student may late drop a course within the first twelve weeks of the semester but will accrue late drop credits equal to the number of credits in the dropped course. A baccalaureate student is limited to 16 late drop credits. The late drop deadline for spring semester 2015 is April 10, 2015.

Evaluation: Your final grade will be calculated over a total of 500 points, distributed as follows:

Midterm #1	115 (23%)
Midterm #2	115 (23%)
Final exam	150 (30%)
Homework & Quizzes	100 (20%)
Seminar reports	20 (4%)
TOTAL	500 (100%)

Grades will be based on the standard percentage scale: 90%-100% is an A, 80-90% is a B, etc, with plus and minuses being given for being in the extremal 2% of the grade range.

Deferred grades: Students who are currently passing a course but are unable to complete the course due to illness or emergency may be granted a deferred grade which will allow the student to complete the course within ten weeks of the

last day of classes. Note that deferred grades are limited to those students who can verify and document a valid reason for not being able to take the final examination. For more information see http://handbook.psu.edu/content/deferred-grade.

Homework: There will be weekly homework, due in class on Tuesdays (date subject to change). No late assignments will be accepted.

Quizzes: There will be weekly in-class quizzes, on Wednesdays (date subject to change), unless otherwise announced. These quizzes will be 1-3 problems, related to the week's homework, and last 15 minutes.

Seminar reports: You are required to attend two math seminars, outside of lecture, and turn in a report on the seminars. A report template will be provided.

Academic Integrity: Collaboration on exams is **not permitted**. Unless explicitly stated, collaboration on quizzes is **not permitted**. All Penn State Policies (http://www.psu.edu/ufs/policies/). regarding ethics and honorable behavior apply to this course.

Students with Disabilities: Penn State welcomes students with disabilities into the University's educational programs. Every Penn State campus has an office for students with disabilities. The Office for Disability Services (ODS) Web site provides contact information for every Penn State campus: http://equity.psu.edu/ods/dcl. For further information, please visit the Office for Disability Services Web site: http://equity.psu.edu/ods.

In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: http://equity.psu.edu/ods/doc-guidelines. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. You must follow this process for every semester that you request accommodations.

Important dates: Please see http://www.registrar.psu.edu/academic_calendar/spring15.cfm for important dates including holidays and administrative deadlines.

Tentative schedule (subject to change)

Week	*Topics*	*Sections covered*	*Notes*
Jan. 12	Inverse functions, exponential functions	6.1, 6.2	
Jan. 19	Logarithmic functions, derivatives of logarithmic functions, exponential growth and decay	6.3, 6.4, 6.5	DROP ENDS Jan 21 ADD ENDS Jan 22, 8am
Jan. 26	Types of growth: semilog and log log plotting with data Inverse trigonometric functions, integration by parts	6.6, 7.1 + handout	
Feb. 2	Trigonometric integrals, trigonometric substitutions	7.2, 7.3	
Feb. 9	Integration of rational functions by partial fractions and other integration techniques	7.4, 7.5	Midterm 1
Feb 16	Indeterminate forms, L'Hôpital's rule, relative rates of growth, improper integrals	6.8, 7.8	
Feb. 23	Numerical integration with MATLAB		
Mar. 2	Numerical integration with MATLAB; Sequences and series	11.1, 11.2	
Mar. 9	–	–	SPRING BREAK
Mar. 16	Series, integral test	11.2, 11.3	SPRING BREAK
Mar. 23	Comparison test, alternating series, absolute & conditional convergence, root & ratio test	11.6, 11.7	
Mar. 30	Power series	11.8	Midterm 2
Apr. 6	Representation of functions as power series, Taylor and MacLaurin series	11.9, 11.10	LATE DROP DEADLINE April 10
Apr. 13	Applications of Taylor polynomials, error approximations, error for numerical integration, curves defined by parametric equations	11.11, 10.1	
Apr. 20	Calculus with parametric curves; polar coordinates, areas in polar coordinates	10.2, 10.3, 10.4	
Apr. 27	Areas in polar coordinates	10.4	

Note: If the topics are covered more quickly than planned, we'll also spend time on differential equations (chapter 9).