Math 125D 1/3/24

Syllabus & Chapter 4.9

MATH 125-D: CALC. W/ ANALYTIC GEOMETRY II, WINTER 2024

Instructor: Dr. Jonah Ostroff, ostroff@uw.edu

TAs: Sections DA and DB: Andrew Niu, amniu@uw.edu

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Section DG and DH: Jonathan Niño-Cortes, janc4@uw.edu

COURSE DESCRIPTION. This is a second-quarter calculus course, focused on integration and its applications.

CLASS MEETINGS. Mondays, Wednesdays, and Fridays, 11:30 AM – 12:20 PM in KNE 210.

TEXTBOOK. *Calculus: Early Transcendentals, Ninth Edition.* If you'd like a physical copy, you get get one from the bookstore. A digital copy is included when you purchase WebAssign (see below).

GRADES. Your grade in the course will be based on the following:

5% Worksheets
10% Homework
20% Lower midterm score
30% Higher midterm score
35% Final exam

As a department policy, the median grade in this class will be somewhere between 2.7 and 3.1. A grade of 2.0 is needed to move on to other courses that require Math 125, and the average needed to attain a 2.0 will never be more than 65%.

LECTURES. Lectures are held on Mondays, Wednesdays, and Fridays. You are required to know all the material presented in lecture, but you are not explicitly required to attend, so you don't need to get permission for absences. If you miss class, you should watch the Panopto recording. Lecture notes will also be posted on Canvas after each class.

HOMEWORK. All homework is due on Wednesday evenings, usually during the week after the material is covered in class. I very, very strongly recommend starting the homework early! It is almost certainly impossible to finish three days of homework assignments on Wednesday evening.

Homework will be submitted online through WebAssign, which you can access by clicking the "Click here to access & register for WebAssign" link on Canvas.

You may miss a total of 10% of the homework points over the course of the quarter without affecting your final grade.

WebAssign is free for the first two weeks of the quarter, and after that you'll need to purchase an access code. If you'd like to request financial assistance in purchasing an access code, there's a link to a form you can fill out (during the first week of the quarter) on Canvas.

QUIZ SECTIONS. On Tuesdays and Thursdays, you'll be meeting with your TA in quiz section to discuss the material and complete worksheets. This is also when you'll take midterms.

WORKSHEETS. Some quiz sections feature worksheets, which you will complete and discuss in groups. They are available on the course website. Once you've completed the worksheet, submit your work via Gradescope. The worksheet will be graded only for completion (so it's okay to make mistakes). You can still submit the worksheet if you miss quiz section.

Worksheets are due on Gradescope at 8 PM on the day it was discussed in quiz section. Your lowest worksheet score is dropped from your final grade.

EXAMS. There will be two midterm exams and one final exam.

- Midterm #1: Thursday, January 25th in quiz section.
- Midterm #2: Thursday, February 22nd in quiz section.
- Final Exam: Saturday, March 9th, 1:30–4:20 PM in KNE 110.

If a conflict arises, contact me immediately.

Do not come to an exam if you test positive for COVID-19 or are experiencing symptoms. Email me and we'll make other arrangements.

On each exam, you may use a TI-30X IIS scientific calculator and one double-sided handwritten page of notes. You may not use other calculators.

ONLINE FORUM. Our online forum, Ed Discussion, is a great place to ask questions about the material. Active participation (either asking or answering questions) in the forum will earn you a small number of extra credit points applied to your final grade. The forum is accessible through Canvas.

OFFICE HOURS. I have three office hours per week:

Jonah's office hours: Tuesdays 11 AM–12 PM, Wednesdays 2–3 PM, Thursdays 10–11 AM

My office hours are for Math 125 and 126, so they're through my personal Zoom link here:

`https://washington.zoom.us/j/3156983625`

Your TA will also be holding office hours, to be announced soon.

Office hours are sessions (in-person or via Zoom) when you can join at any time to ask us questions about the course, homework, etc. If you can't make any office hours, you can also ask questions over email or Ed Discussion, or you can email me to set up an appointment.

LATE POLICY. Life happens, and I'm always willing to grant the occasional extension for homework assignments or worksheets. Just email me or your TA if you need one.

COVID PREVENTION. Do not come to class if you have tested positive or are experiencing symptoms of COVID-19. There is never any reason to come to class when you are sick: all lectures are recorded via Panopto, all worksheets are submitted online, and if you miss an exam we can make alternate arrangements. I also strongly recommend wearing a well-fitted, high quality mask to class.

WEBSITES. All of this information and more can be found on Canvas:

`https://canvas.uw.edu`

General information about Math 125 is available on the UW course website:

`https://sites.math.washington.edu/~m125/`

OTHER RESOURCES. The Math Study Center is a math-specific tutoring center here:

`https://sites.math.washington.edu/msc/`

This is a great place to ask general questions about Math 125 material. If you have a question more specific to this class (e.g. about grading or exam policies), you should instead ask it on our class's Ed Discussion page.

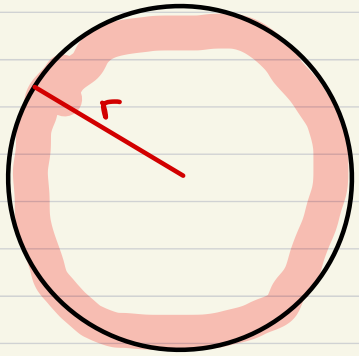
ACADEMIC HONESTY. I take cheating very seriously, and will report any instances to the department of Community Standards and Student Conduct. If you are found responsible for cheating on any part of an exam, your score on the exam will be a zero. Furthermore, the grading policy where the lower midterm score is weighted less in your grade does not apply to zeroes earned due to cheating.

STUDENTS WITH DISABILITIES. The University of Washington is committed to providing access, equal opportunity and reasonable accommodation in its services, programs, activities, education and employment for individuals with disabilities. To request disability accommodation, contact the Disability Services Office at least ten days in advance at: 206-543-6450/V, 206-543-6452/TTY, 206-685-7264 (FAX), or dso@u.washington.edu.

RELIGIOUS ACCOMODATIONS. Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at Religious Accommodations Policy. Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form.

	Monday	Tuesday	Wednesday	Thursday	Friday	Notes
Week 1 Jan. 3 – Jan. 5	No class	No class	Chapter 4.9	Worksheet 1* Area Problems	Chapter 5.1	*Worksheet 1 isn't handed in.
Week 2 Jan. 8 – Jan 12	Chapter 5.2	Q&A	Chapter 5.3 HW Intro*, 4.9, 5.1	Worksheet 2 Fundamental Theorem of Calculus	Chapter 5.4	*Intro to Webassign is optional.
Week 3 Jan. 16 – Jan. 19	MLK Day	Q&A	Chapter 5.5 HW 5.2, 5.3, 5.4	Worksheet 3 Area Between Curves	Chapter 6.1	
Week 4 Jan. 22 – Jan. 26	Chapter 6.2	Q&A	Review HW 5.5, 6.1	**Midterm 1** In quiz section	Chapter 6.3	Midterm 1 covers up through Chapter 6.1.
Week 5 Jan. 29 – Feb. 2	Chapter 6.4	Q&A	Chapter 6.5 HW 6.2, 6.3	Worksheet 5 Integration by Parts	Chapter 7.1	
Week 6 Feb. 5 – Feb. 9	Chapter 7.2	Q&A	Chapter 7.3 HW 6.4, 6.5, 7.1	Worksheet 6 Partial Fractions	Chapter 7.4	
Week 7 Feb. 12 – Feb. 16	Chapter 7.5	Q&A	Chapter 7.7 HW 7.2, 7.3, 7.4	Worksheet 7 Integration Techniques	Chapter 7.8	
Week 8 Feb. 20 – Feb. 23	Presidents' Day	Q&A	Review HW 7.5, 7.7, 7.8	**Midterm 2** In quiz section	Chapter 8.1	Midterm 2 covers up through Chapter 7.8.
Week 9 Feb. 26 – Mar. 1	Chapter 8.3	Q&A	Chapter 9.1 HW 8.1, 8.3	Worksheet 9 Differential Equations	Chapter 9.3	
Week 10 Mar. 4 – Mar. 9	Chapter 3.8/9.4	Worksheet 10a Review 1	Review HW 9.1, 9.3, 9.4	Worksheet 10b Review 2	Review	**Final** (Saturday, Mar. 9) 1:30–4:20 PM in KNE 110
						The final is cumulative.

Intro



Area $= \pi r^2$

Why?

Circumf $= 2\pi r$

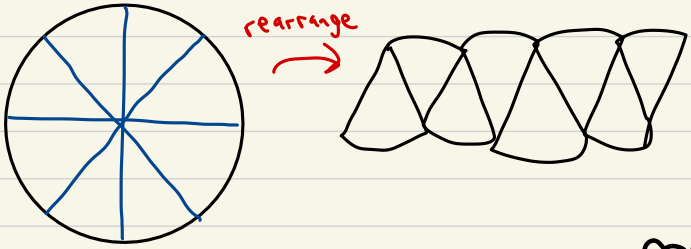
Main big idea:

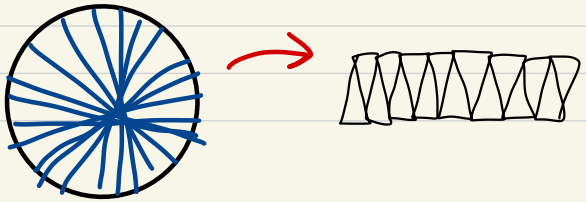
take a hard geometry problem

cut into pieces and approximate answer.

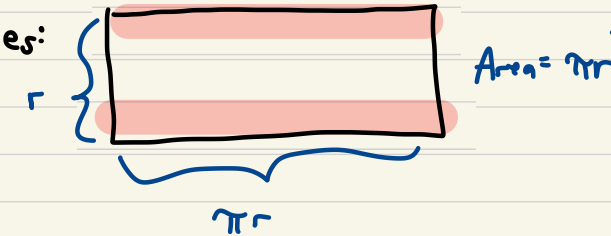
Something

As # pieces $\to \infty$, approximation gets to be exact.





only many pieces:



Chapter 4.9: Antiderivatives

Definition $F(x)$ is an **antiderivative** of $f(x)$ if $F'(x) = f(x)$.

In other words: "F is an antideriv. of f" means "f is the derivative of F."

Ex Find an antiderivative of $f(x) = 2x$.

$F(x) = x^2$ (because $\frac{d}{dx}(x^2) = 2x$.)

$F(x) = x^2 + 4$ also works!

$F(x) = x^2 + C$

↑ any constant

the "general antiderivative" of f.

Ex Find the general antideriv. of $f(x) = x^3$.

$\frac{d}{dx}(x^4) = 4x^3$ $\frac{d}{dx}\left(\frac{1}{4}x^4\right) = x^3$

$F(x) = \frac{1}{4}x^4 + C$

List of basic antideriv.

antider. of $f(x)$

$f(x)$	$F(x)$
1	x
x^n ($n \neq -1$)	$\frac{x^{n+1}}{n+1}$ (power rule)
e^x	e^x
$\cos(x)$	$\sin(x)$
$\sin(x)$	$-\cos(x)$

$f(x)$	$F(x)$
$\sec^2(x)$	$\tan(x)$
$\sec(x)\tan(x)$	$\sec(x)$
$-\csc^2(x)$	$\cot(x)$
$-\csc(x)\cot(x)$	$\csc(x)$
$\frac{1}{x}$	$\ln\lvert x\rvert$

$f(x)$	$F(x)$
$\frac{1}{1+x^2}$	$\arctan(x)$
$\frac{1}{\sqrt{1-x^2}}$	$\arcsin(x)$
a^x (a some constant)	$\frac{a^x}{\ln(a)}$

Antiderivatives you can immediately solve in your head. (Learn these!)

Recall: $\frac{d}{dx}\left(c f(x)\right) = c f'(x)$ and $\frac{d}{dx}\left(f(x)+g(x)\right) = f'(x)+g'(x)$

(c: constant)

Similarly: If $F(x)$ is the antider. of $f(x)$, then $cF(x)$ is the antider. of $cf(x)$.

If $F(x)$ and $G(x)$ are antiders of $f(x)$ and $g(x)$, then $F(x)+G(x)$ is the antider of $f(x)+g(x)$.

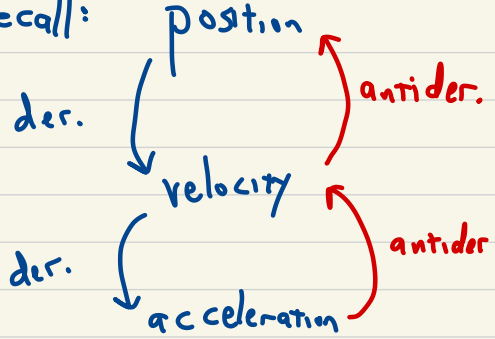
Ex] Find the general antid. of $\cos(x) + 5e^x$.

($\cos x$: $\sin x$; e^x: e^x)

$\sin(x) + 5e^x + C$

Velocity & Accel. :

Recall:



Ex] A particle has acceleration

$a(t) = e^t + 8t + 4$ at time t.

Also at time $t=0$ its position is 0
and at time $t=1$ its position is e.

Find the position func. at time t.

anti. ↓

$v(t) = e^t + 4t^2 + 4t + C$ ← find C later

↓ ?

$s(t) = e^t + \frac{4}{3}t^3 + 2t^2 + Ct + D$

↓ plug in $t=0$

$0 = 1 + 0 + 0 + 0 + D \rightarrow D = -1$

plug in $t=1$

$e = e + \frac{4}{3} + 2 + C + D \rightarrow C = \frac{-4}{3} - 2 - D = \frac{-7}{3}$

So $s(t) = e^t + \frac{4}{3}t^3 + 2t^2 - \frac{7}{3}t - 1$