DAILY HOMEWORK

Assignments given on day of the lecture and are to be done before the following lecture. The range of days when you should be working on them is in bold.

For your convenience the first few days, I have put assigned exercise numbers here. Eventually, you will see only to "Do the assigned exercises in Sec X", and the numbers will be found on the pdf Assigned Exercises. Exercises will be taken from other texts and worksheets as well.

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WEEK 1 August 24-27

Wed Aug 25-Thurs Aug 26 Read Chapters 1&2, paying attention to what was emphasized in class.

in Math 220 text and do the assigned exercises:

Section 1 page 5 #1, 2, 8a–i

Section 2 page 15 #1, 2a-e, 3, 5, 8, 9, 12, 14a–d

If you have time tonight (but ok to wait for weekend):

View Solving quadratic equations by factoring and Solving radical equations

Then do some problems on Solving quadratics worksheet and on Solving radicals worksheet

Fri Aug 27-Sun Aug 29 The first reading is from the Bittinger textbook. The first few pages are a review of lines, which you may or may not need. The applications pages are essential, and have better detail than our book.

- Read Linear Cost, Revenue, Profit Functions (Bittinger text)
- Read Sec. 3 in our textbook
- View Cost/revenue/profit 1, Cost/revenue/profit 2, Cost/revenue/profit 3
- Do exercises in our text Sec 3 page 26 #1–4; try #6–14 (the Bittinger reading and our text have many examples of this type)

WEEK 2 Aug 30-Sept 3

Mon Aug 30-Wed Sept 1 Note that many textbook solutions can be found under the link on the main Math 220 page, and here Annotated solutions to exercises

- Finish reading Sec 3, our book and Bittinger pdf, esp the cost/revenue/profit pages (see weekend posting)
- Read Sec 4 in our book
- Do Sec 3 exercises #6-14 in our book
- Review solving log and exponential equations in these videos, as much as you need each one to understand

Properties of logs, Solving log equations, Solving exponential eqns (same base), Solving exp eqns (different bases)

Wed Sept 1-Sun Sept 5 View Wednesday lecture videos (total length < 90 min) Wednesday Lecture part 1, Wednesday lecture part 2, Wednesday lecture part 3/4

Do Sec 4 pp 42-44 #1–7, 10a–d, 11a–e, 12, 14 [do also base e], 20a–e, 21a, b, f

Watch the video The meaning of e

No quiz in class, obviously, today, but I will collect a homework (to be posted) next Friday, after break, and we will have a quiz on class on cost/revenue/profit and of course the essential function graphs!

WEEK 3 Sept 6-10

- View mini-videos and read Sec 6 on Limits

Finding limits from a graph (This is one of his rougher videos, but well explained.)

Evaluate limits using properties, Ex 1

Evaluate limits using properties, Ex 2

- View my Lecture on Limits (the Friday lecture video) *No need to watch it all in one sitting.*
- Do Assigned Exercises (Sec 6) on p 66 (pdf p 71)

NOTE: I'll check attendance for Wed and Fri by looking at the Panopto logs (who viewed and for how long). Wed lecture took four smaller recordings. Fri I did in one long recording, so take a break in the middle!

- Do Take-home quiz (Quiz 1). SUBMIT IN PERSON FRIDAY.
- Study for Friday's in-class Quiz 2: Essential fcn graphs, piecewise fcns, domain, solving a radical and an exponential equation.
- See Math 220 page for folder with DCN notes. These are Instructor David Cervantes Nava's lecture notes, which he's sharing with all sections. Feel free to access them to supplement my own.

WEEKEND OF SEPT 10-12 View the rest of the limit videos finish the limit exercises (I haven't done an example of indeterminate form in class, but below Patrick does loads of them):

More techniques for evaluating limits, Ex 3

Ex 4 involving radicals

Ex 5 also with radicals

Ex 6 involving rational expressions

Infinite limits

Read Sec 5

View Where does e come from?

The History of e

Compound interest (n times/year)

Continuous interest (infinite times/year)

WEEK 4 Sept 13-Sept 17

Mon Sept 13-Tues Sept 14

Extra help videos on Finding domain 1 and Finding domain 2; here's the supplementary worksheet with Practice on domains

Do Sec 5 pp 56-57 (first set of exercises only): #1, 3, 2 (in this order), #4–7

Wed Sept 15-Thurs Sept 16

- Read Sec 7 and Sec 8 and view Difference quotient (DQ) and the definition of derivative
- Do Sec 7 Assigned Exercises #1b, d, a, c, e, f (in this order), 3a–g
- Study for Friday quiz on exponential equation solving, limits and compound interest
- Do Take home #1 (compound interest) and hand in Friday

Friday Sept 18-Sunday Sept 20

The videos will take the place of the reading of Sections 9 and 10:

- Differentiation Techniques and the Power Rule
- Power rule examples
- Do Assigned Exercises in Sec 8: #1-5 *using power rule, not the definition of derivative!!*
- Read Selection 1 and Selection 2 on marginal functions and derivatives
- Do Exercises Sec 10 p. 91 #3, 4, 6
- Finally, watch Continuity and limits made easy

WEEK 5 Sept 20-Sept 24

Mon Sept 20-Tues Sept 21

- Exam 1 is moved to Monday Sept 27
- View (for real):

Derivative exponential fcn with base a

Derivative log fcn with base a

Product rule examples

Quotient rule examples

- Do Sec 10 Asssigned exercises #8–10, 13a, d, e, 15, 16a–g, j
- Supplemntary reading (and a great learning aid) Bittinger derivative sections
- Derivative shortcut quiz tomorrow. Be ready, no notes.

Wed Sept 22-Thurs Sept 23

- View (and I'm serious):

Proof of chain rule

Chain rule explained by Patrickmjt

Ex of chain rule for radical function

Ex of chain rule for natural log function

- Read Sec 11
- Do Assigned Exercises Sec 11 #1, 2a–h, k, l, 3a–f, h–o, r, 4c, d, e, 6, 7, 9, 13 all, 15, 16a–g, j, m–o

See Prof DCN and Student MK for their lecture notes, which are also on the Math 220-03 and -04 Fall 2021 main page

REVISED DERIVATIVE RULES AND EXAMPLES

Sept 25-26 Weekend study for Exam 1

The topics to focus on include (the first was not mentioned on Friday):

- Solving for intercepts and roots of a function (critical skill we looked at the first week)
- Domain of functions (interval notation) and graphing piecewise f(x) made up of essential functions
- Find equation of a line tangent to a curve f(x) at a point
- Evaluate limits including the in the definition of the derivative for one function
- Continuity–reading from a graph where a function is not continuous and why it fails according to the definition: f(x) is continuous at x = a if f(a) exists and is equal to lim f(x) as x –> a
- Cost/revenue/profit functions, demand function, break even point, marginal analysis (ideas from handout)
- Derivatives computation, see REVISED DERIVATIVE RULES AND EXAMPLES
- NO COMPOUND INTEREST ON THIS EXAM

Here is a another professor's previous semester exam solutions with some notes on tomorrow's exam

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WEEK 6 Sept 27-Oct 1

Wed Sept 29

Implicit differentiation method often lets us find rates of change of one variable with respect to another even if there is no explicit function present. For example, the circle isn't a function, but its tangents are of interest to us. Differentiating the equation without solving for either of its 'branches' (top and bottom semicircles) is easier using ID.

Implicit differentiation (ID)

Proof of derivative of natural log function and Proof of derivative of exponential function (base a) both use implicit differentiation.

More ID examples (at 3:30 the ex has a non-trig equation)

Read Sec 14 Related Rates and corresponding section in Bittinger, Section 2.7 (pp 288-292)

Do Assigned Exercises for Sec. 12 #1, 2a, b, 4, 7, 8, 9 and Sec. 13 #1, 2a–c, 3, 5, 6, 8 (for discussion tomorrow)

Hand in tomorrow: Sec 12, #7, 8, 9 and Sec 13, #2c, 3, 6

Friday Oct 1

Watch Using ln and implicit differentiation to replace product and quotient rule

Do Assigned Exercises in the textbook for Sec 14 Related rates #1–6, 8–10, 12, 13. *These are not the ones to hand in, but have them handy to show me later in the week*

Friday recording I made a division mistake toward the end. See if you can spot it.

Add to the HW to hand in:Bittinger related rates problems (see Sec 2.7 in that text)

Previous HW said there would be a quiz on Monday, but that was a mistake. The next quiz is Wednesday. Thanks JC for catching it.

WEEK 7 Oct 4-8

Mon Oct 4-Tues Oct 5

Critical numbers . A critical number x = c of a function f(x) is a number in the domain of f where EITHER f'(x) = 0 OR where f'(x) does not exist. The relative extrema of a function occur at critical numbers.

Finding the critical numbers of a function is the first step to examining the behavior that a function models. Where it increases, decreases, attains local extremes and so on.

- Read Sec Sec 2.1 of Bittinger (roughly corresponds to Sec 15 of our book)
- View:

Extremes of a function

Critical numbers 1

Critical numbers 2

Increasing and decreasing functions

- Do in our text the assigned exercises in Sec 15 on pp 129-130 #2, 4 a-i

Let's move the mini-quiz to FRIDAY. It will be on implicit differentiation and related rates.

Wed Oct 6-Sun Oct 10 Read Bittinger Sec 2.2 (corresponds to our textbook Sec 17; we're skipping Sec 16 for now)

View More finding critical numbers of a fcn

First derivative test

Second derivative test and concavity

I will you make copies of McKenzie summary of Secs 15, 17, 18

Mini-quiz Friday: 1 related rates problem and 1 implicit differentiation, similar to Bittinger word problems.

Bittinger exercises ! Work on these throughout the rest of the week and the weekend. It's not as much as it looks. Some are short answer.

You'll do these instead of our text exercises, and be sure you read the Bittinger sections as well:

Read Sec 2.1 and do exercises #7, 13,19, 21, 23, 27, 29, 71, 83, 89

Read Sec 2.2 and do exercises #9, 13, 27, 35, 39, 45, 49, 51, 103, 109, 113

WEEK 8 Oct 11-15

Mon Oct 11-Tues Oct 12

- Read Sec 2.3 in Bittinger
- View the following videos on curve sketching using skills learned so far:

Examples first and second derivative test to graph functions

Graphing a polynomial

Graphing a rational function

Graphing another rational function

Wed Oct 13-Sun Oct 17 Do over Fall break and hand in on Monday: Practice curve sketching assignment

You may use your notes and videos, but work independently!

For #4, the rational function, I plan to cover it tomorrow. We will do it as an in-class exercise, before you hand it in!

Also, though *not* to hand in: Revisit the topic of Related rates with supplemental worksheet; the solutions are available at the Supplemental Materials link.

WEEK 9 The assignments are given in one list to work on up till Tues Oct 26, the day before Exam 2

😎 Exam 2 Oct 27 covers Sections 13 through 22 in our textbook 😃

NOTE: DCN's latest lecture available notes are now posted, though one section is missing; he will share it soon

- Read in Bittinger Secs 2.2-2.4 – not every word, but *look at the examples and the wonderful graphs*
- Do in Bittinger – refer to Steps to curve sketching for guidance (and we will do several in class)

Sec 2.2 #7, 11, 25, 35, 41, 43, word problem #106

Sec 2.3 #3, 7-21 odd, 29, 31, 35, 41 (hole), 49, word problems #63, 65, 67, 73

Sec 2.4 #5, 15, 21, 35, 37, 53, 61, 79, word problem #103

- Short videos on the Sec 16 theorems; a *light treatment* of the concepts will be on Exam 2:

Intermediate value thm

Rolle's and mean value thms

Extreme value thm which relates to *absolute extrema*.

In applications, the domain is usually a *closed interval*, so we need to check not only local extreme *values* but also the function *value* at its endpoints. Problems in this will be posted soon

😀 POP MINI QUIZ ON FRIDAY We will correct it in class. It will be on curve sketching!

WEEKEND STUDY FOR EXAM 2

First of all, I realize I never linked you to the Videos for related rates. Here they are!

Implicit differentiation and related rates

Related rates 1: Area of circle and changing radius rate

Related rates 2: Area of triangle and changing side length rate

Related rates 3: Ladder sliding down the wall problem

And finally, a video on related rates that applies to a business application:

Cost and profit with respect to time

WEEK 10 Oct 25-29

Exam 2 review exercises for Monday

In-class solutions of Exam 2 review exercises

Rest of solutions 1, 2, 3, 4, 5, and 6

For WEEKEND 11 Oct 29 - Nov 1

We begin Unit 3 – OPTIMIZATION (maximization/minimization of functions).

We use critical numbers and extrema to find where functions such as revenue, cost and profit reach their max or min. There is also more discussion of demand functions vis-à-vis elasticity of demand and how this plays into maximizing revenue. Price is looked at more closely now. We also look at multivariable functions, which are more typical of real life, since more than one variable type often figures in any of the functions we have studied.

The unit roughly covers *Math 220 Course Notes* (Geoghegan text) Sections 22-29 and Bittinger Sections 2.4 and 2.5 and Sections 6.1-6.3 and 6.5. We will be reading from both books.

Fri Oct 29 - Sun Oct 31 (boo)

Over the weekend, please do Assigned Exercises #3a–e, 4–8 in Sec 22 read *in our text*.

Read Sec 23 and do #1-7

View Minimize surface area of a cylinder and Optimal pricing to maximize computer software sales

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WEEK 12 Nov 1 - Nov 5

Mon Nov 1 - Tues Nov 2

- *Watch all at least once*; the content is seen in quizzes and tests for the next two units
- Sec 23, p 192 do #9, 10, 12, 15, 16
- View Hot dog problem and Optimizing revenue given two points of data
- Read Sec 24
- TAKE HOME OPTIMIZATION QUESTIONS DUE FRIDAY *Show all work, neatly, no partial credit for partial work Work independently*. It's open book and notes. The videos I've put up should be sufficient, but see me if you need guidance.

Wed Nov 3 - Thurs Nov 4

- STUDY FOR FRIDAY OPTIMIZATION QUIZ (it will cover Sec 23 and Sec 24 homework problem content)
- Do Sec 24 p 199 #1-9
- Wednesday lecture videos are at 11:20 class and 1:10 class
- Prof DCN Lecture Notes and Student MK Lecture Nots are up to date at these links.

WEEKEND Fri Nov 5 - Sun Nov 7

- Take a break from optimization exercises till Sunday.
- Elasticity of demand part 1 and part 2
- Do Sec 26 exercises p 212 #1, 3-8 (we can do #3 in class on Monday)
- View Super cool graphics explaining partial derivatives

and Partial derivative examples

Here is the Workshopped Quiz 5 to hand in for a grade on Monday (even if you were present, I would like to collect it)

WEEK 13 Nov 8 - Nov 12

Mon Nov 8

* Do Sec 27 partial derivatives, assigned exercises #1a, b, d, e, f, h, I, 2a–d, f, #3–5, 7

- View Anil Kumar's example of the Lagrange multiplier method of solving optimization w/constraint
- Read and see the many examples in Bittinger Sec 6.5, Lagrange multiplier method
- *Short* quiz Wednesday on elasticity and partial derivatives

Wed Nov 10

- VERY IMPORTANT VIDEOS:

1. Krista King's example of Lagrange multiplier method

2.Anil Kumar's 4 examples of the Lagrange multiplier method

3. Understanding the Cobb-Douglas production function (and its marginals) P(L,K), where L is units of labor and K is units of capital

4. Solving a Cobb-Douglas production function for L and K that result in maximum production

To study/work through for exam review:

As emailed: Practice problems Exam 3 (you won't have curve sketching) and Solutions

To practice Lagrange optimization: Our text, Sec 29 p 233 #1, 2a, b, c, 4–6, 8, 9

WEEK 14 Nov 15 - 19

Mon and Tues

We are in the final and most important unit. If you don't watch the videos before class as assigned you will not be able to grasp the content in lecture. Integration applications make up a major area of calculus in all the disciplines where it is used.

Read the first several pages of Bittinger Integration Part 1 (Antiderivatives)

Watch: Antiderivatives and indefinite integration

Examples of basic indefinite integration

Wed-Thurs

Do Exercises #1-70 *every odd numbered exercise* on PDF pp 9-11 in Bittinger Integration Part 1 (Antiderivatives)

Fri-Sun The previous videos included ones I didn't mean to post at at the start of the unit. I've reviewed and adjusted the videos:

View Overview of antiderivatives and initial condition problems

Read all of pp 1-9 of Bittinger Integration Part 1

Do #47-57 odd, Bittinger pdf p 10

View Applying integral to marginal cost to find total cost function

Do #61-66 all, Bittinger pdf p 10

THANKSGIVING WEEK(END) Nov 22 - 28

For Monday Nov 29, preview: u-substitution (up to minute 6:00 is indefinite integrals; after that he does definite, which you can watch as a preview of week ahead – super easy!)

Read *all* of Sec 4.5 (u-substitution) pp 436-442 in Calculus and Its Applications, 10th ed. Bittinger et al.

Do in Bittinger pp 443 and 444: #5-25 odd, #63, 67, 69 (two u-subs are needed, see Example 12 technique) and word problems #71-73

WEEK 15 Nov 29 - Dec 3

Monday Lecture video

Due Wednesday, Dec 1, *really*, no exceptions: Integration take-home 1

Mon-Tues Little change here: going back to our text, where we don't run into definite integrals just yet

Sec 30: *Antiderivative word problems* without u-sub, pp 242-244 #4-8

Sec 31: *u-sub* – read for many great examples; do pp 248-249 #1 all and #3–5

Sec 32: *Integration by parts* – view Integration by parts; read; do #1 b, d, e, g, h, i, #3

Sec 33: View this fantastic pre-lecture video (up to minute 7:10):

Finding a definite integral, fundamental theorem of calculus

Due to my illness, class will again be on zoom tomorrow. It will be the same link as usual, but you will get it in an email. I will send the invite to you 10 minutes before we meet so you have no trouble accessing it.

Wednesday Sec 03 lecture recording and Sec 04 lecture recording

Now watch ALL of Finding a definite integral, fundamental theorem of calculus

Do Sec 33 exercises #1b, c, e, h, I, j, k, o, p

Quiz on Friday, no notes allowed, u-sub, IBP, word problem, and evaluate a definite integral!

Weekend Dec 4/5

Watch the mini-videos for definite integrals in case you didn't check the link on your own :

- Example 1 and Ex 2 and Ex 3 (log and IBP) and Exs. 4 and 5 (two more IBP)
- Do Sec 34 exercise #1a–f, 4, 6a, c, e, g, 8, 9
- Read Sec 35 first pp (Riemann sum and average value of a function)

FINAL WEEK !!

Mon-Tues

- View this very short video on Average value of a function theory and formula and An example and Average value of a function and applications (word problems in second half)
- As you just saw in the videos, the average value of a function on [a, b] is simply the definite integral of the function on the interval, all divided by the length of the interval.
- Do assigned exercises Sec 35 #1 a, d, e, 2, 3, 7, 8, 10

- Before you read the rest of the Sec 35, you should review Compound interest and future value and Present value

Then view Applying definite integrals to continuous income streams

Wednesday Finish Sec 35 exercises #11-16,18

I recorded the second lecture on Wed due to a reasonable student request. It's a better presentation than the first:

Wednesday zoom lecture, recorded

😎 FINAL REVIEW WORKSHEETS (you will notice some duplication among these documents; along with supplementary worksheets as needed):

Unit 4 integration review exercises

More Unit 4 integration review exercises

A few more Unit 4 integration review exercises

Unit 4 previous semester comprehensive quiz

TUESDAY DEC 14

First set EXAM 4 REVIEW EXERCISES PART I AND SOLUTIONS

Second set EXAM 4 REVIEW EXERCISES PART II AND SOLUTIONS

Third set Unit 4 Find total function from various rate functions of economics and business (know how to set these up; the numbers on these are best done on a calculator, whereas the numbers on the test will be mental math friendly)

😎 FINAL EXAM FRIDAY DEC 17 12:50-02:50 PM IN LH 014