Math 112 End of Week 7 Newsletter

UPCOMING SCHEDULE:

Friday (Today): 12.4 – Antiderivative Applications and Finding the Constant of Integration
Monday: 12.4/13.2 – Definite Integrals, Areas, and the Fundamental Theorem of Calculus
Tuesday: Test Prep / HW Q & A
Wednesday: 13.2/13.3 - Areas between curves (with applications to profit and distance between balloons)
Thursday: Test Prep / HW Q & A
Next Friday: 13.3/Review: Areas between Curves and Review

***Activity 7 Solutions*:** Please go read through the solutions to activities 6 and 7. You did Activity 7 in quiz section last week, it gives a nice intro to areas under curves and does in an applied example (getting TR/TC from MR/MC by using area under MR/MC). If that worksheet confused you, now would be a good time to go back and review it.

HOMEWORK: Closing Tuesday: HW 12.4 and Closing Thurs**:** HW 13.2

NEW POSTINGS: Check out the new postings:

1. Overview of 12.4: Applications and Review*: Please check out pages 1, 2 and 3 as they give an essential reference for everything we have done in 10.1-10.3 and 12.4. Then check out the two full pages of examples from old exams with detailed solutions:*

https://sites.math.washington.edu/~aloveles/Math112Winter2019/m112review12-4.pdf

2. Overview of 13.2: *This explains the connection between areas and antiderivatives. There are 2 pages of computational examples, then a full applied problem from an old exam (with detailed solutions). Check this out before lecture on Monday to get a preview of what we will be talking about:*

https://sites.math.washington.edu/~aloveles/Math112Winter2019/m112review13-2.pdf

OLD EXAMS: You can also see the entire exam archive here: https://sites.math.washington.edu/~m112/Archives.html
Note: We have put together two collections of old exam review problems. I encourage you to print these off now.

For practice with 12.4: Applications
All of: https://sites.math.washington.edu/~m112/Midterm2/ExamIIReview.pdf
(pages 3 and 4 of the compilation of problems above are actually from 13.2, but the rest only require ideas from 12.4)

For practice with 13.2: Fundamental Theorem of Calculus and Areas
Problem 1(c): https://sites.math.washington.edu/~m112/Midterm2/Sp17_bekyel_MT2.pdf
Problem 3(b) and 5(d): https://sites.math.washington.edu/~m112/Midterm2/112_Wi16_MT2_nichifor.pdf
Problem 4 of: https://sites.math.washington.edu/~m112/Midterm2/win14examIIloveless.pdf
Problem 4a of: https://sites.math.washington.edu/~m112/Midterm2/spr16examIItaggart.pdf
Pages 3 and 4 of: https://sites.math.washington.edu/~m112/Midterm2/ExamIIReview.pdf

On the next several pages, I give detailed comments and hints (and several answers) for homework, based on common questions from office hours. Please, please, please read these hints. I'm trying to get you to start and finish the upcoming homework now, so that you have more time to study for the exam next week.

Read the next pages!!! I give hints for every homework problem in 13.2!!! Read on…

***General Comments and Hints on HW 12.1-3**:*

It appears most students have completed this section quickly, nice work! The only one I got asked about in office hours was this one.

Evaluate $\int \frac{6}{e^{5x}}\,dx$

STEP 1: Rewrite the powers!

$$\int \frac{6}{e^{5x}}\,dx = \int 6\,e^{-5x}\,dx$$

STEP 2: Use the rule (remember there are only 4 basic rules):

$$\int 6\,e^{-5x}\,dx = 6\left(\frac{1}{-5}e^{-5x}\right) + C = -\frac{6}{5}e^{-5x} + C$$

If you are having trouble, please review the examples we did in lecture, or check out the 12.1/3 review sheet, or check out the examples in the book, or visit the math study center. This should be a fast homework.

General Comments and Hints on HW 12.4:

Please, spend a lot of time on this section making sure you completely understand how to do ALL the problems. Keep asking yourself, could I do this same problem on a test (remember homework problems often appear directly on tests). Again keep asking yourself, do I understand this, how would I do this on a test…

There is nothing new in 12.4, you are just putting together the key ideas you learned in 10.1-10.3 in combination with the new derivative and antiderivative ideas. So you don't need any new tools but you do need to. Let me give the process again:

1. **Read the question**. What are you given, what do you want?

2. **What is the "original function"?** This is the function the question is about and it will always be clearly stated in the problem, but you have to read the problem. Can you get this "original function" from what you are given by using derivative or antiderivatives?

3. **Translate/Solve**: Translate the questions using the concepts we have been talking about for a couple months now. You should know well the terms positive/negative, increasing/decreasing, concave up/down and how to find out about them. You should know well the terms local max/min, global max/min and inflection points. These ideas and concepts need to be solidified in your head by now, if they are not, then spend some quality time going back and reading all the 10.1-10.3 homework (ask yourself, how did you do each of those homework questions and could you do them again on a test).

   You often have to solve when the derivative is equal to zero, so make sure you know how to do all the algebra necessary to accomplish this (know all the algebraic techniques you used in homework).

4. **Conclusion:** Go back and read the question again. Did you answer the question? Did it ask for quantity or profit or price, make sure to actually answer the question that was asked.

Read my 12.4 review sheet for a full summary of all the business functions and how to approach all the problems. ***Then try to do the 12.4 homework WITHOUT help from notes or a tutor***. You need to start doing those problems on your own.

See the next page for hints on 13.2:

Detailed Hints on 13.2 (for those of you that want to work ahead, here are some hints on 13.2 to get you started, I will lecture on this on Monday):

13.2 / Problem 1: A(m) is the accumulated area under f(x). Thus, from lecture, A'(m) = f(m).
You are given f(m) (which is the derivative of A(m)), so you should be able to use all the standard connections to answer the question. For example, A(m) changes from increasing to decreasing when f(x) changes from positive to negative.

13.2 / Problem 2: First recognized what you are given and what you want!

A(t) = height (in feet) = area under the given graph
A'(t) = r(t) = rate of ascent (in ft/min) - GIVEN THIS GRAPH
A''(t) = r'(t) = rate of rate of ascent (in ft/min^2) = slope of the given graph

Use all your standard techniques.
For example to find when the balloon is rising and getting slower, you need to find when A'(t) (which is the given r(t)) is positive and when A'(t) is decreasing (which is when r(t) is decreasing).
For part (i): Recall from earlier in the term that "Average rate of ascent from 0 to 3" = (A(3)-A(0))/(3-0).
Then remember that A(3) - A(0) = the area under r(t) from 0 to 3.

13.2 / Problems 3-13: These should be quick computation problems. See my integration examples in the 13.2 review.

13.2 / Problem 14: One note about units. The definite integral is a number. The units of that number are the units of the output times the units of the input (because it is an area). So for example, if f(x) is in ft/sec and x is in second, then the definite integral of f(x) will output a number that is in units of feet. In this problem, the units of f(t) are (thousands of dollars)/year and the units of t are years, so the integral of f(t) will be in thousands of dollars. (so if you get the interval value to come out as 1847.576, then rounded to the nearest thousand dollars would give 1848 thousand dollars).

13.2 / Problem 15: In this case you can find the formula for F(m), so you might as well do it right away. At that point you have the formula for F(m) and F'(m). Do all the standard things to answer the questions.

13.2 / Problem 16: More practice with applications, this is a 12.4 questions (but the last part (f) is a definite integral)

At this point we can now ask any question about derivatives and anti-derivatives and their connections. Please go check out the exam archive for more practice.

Hope this helps.

- Dr. Andy Loveless