Collaborative Learning Online

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Course Structure

1:32 PM Tue Oct 20 — myclass.ufv.ca — 98%

WEEK 5: Volumes and Improper Integrals

This week, we apply our knowledge of integration to determine volumes of revolutions. We also extend the idea of integration to what we call indefinite integrals. Below are all of the tasks you need to complete this week, *in a suggested order*. While you do not need to complete the tasks in this order, I encourage you to do so. Indeed, you could choose to watch all the videos at once and then do your entire Webwork homework assignment at once.

You should only complete the Weekly Reflection and Webwork Quiz once you have completed all lectures and the majority of the associated Homework.

Learning Objectives for Week 5

6.2: Volumes

- Justify and explain the formula for finding volumes of solids via slices
- Find the volume of solids obtained by rotating a curve around an axis, using slices

6.3: Volumes by Cylindrical Shells

- Justify and explain the formula for finding the volumes of solids via cylindrical shells
- Evaluate the volumes of solids of revolutions using cylindrical shells

7.8: Improper Integrals

- Identify whether or not an integral is improper
- Use the definition of improper integral to write an improper integral as the limit of a definite integral
- Evaluate improper integrals where one of the limits of integration is improper
- Evaluate improper integrals where the function being integrated has an asymptote in the interval of integration

Things to do for Week 5

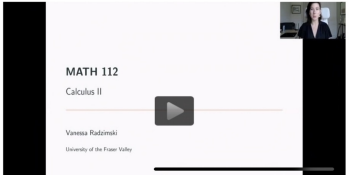
1. Watch all three lecture videos (required)
2. Complete Webwork Homework 5 (required)
3. Complete Weekly Reflection in Learning Journal (required)
4. Complete Webwork Quiz 4 (required)
5. Complete additional recommended problems (not required)
6. Download "in-class" worksheet, to be completed during synchronous meeting on October 20, 2020 (required)

Slides for Week 5

Attached Files: volumes_and_improper.pdf (2.117 MB)

Above is the download for the empty slides for this week and next.

Watch this video up to 21:09 (end of slide 8)



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Practice, part 1

Please go to Webwork and try **problems 1, 2, and 3 in Homework 5**

Watch this video from 21:09 to 46:17 (the end of slide 14)

WeVu Discuss or Annotate

Practice, Part 2

Try problems 5, 8, and 9 in Homework 5 on Webwork

Watch this video from 46:17 to the end

WeVu Discuss or Annotate

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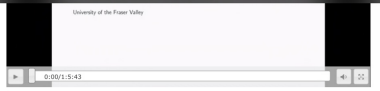


WeVu Discuss or Annotate

Practice, Part 3

Try problems 11, 13 and 18 in Webwork Homework 5.

Complete Webwork Homework 5 and Quiz 4

Complete all of Homework 5 and Quiz 4 in Webwork.

Both are **due by 11:59pm on October 23, 2020**

Synchronous Class Worksheet

Availability: Item is hidden from students.
Please download this file for our synchronous class. It will be completed in groups.

Additional Problems from the Text

Section 6.2:

#1-18 odds, 31-38 odds, 46, 49, 63, 65

Section 6.3:

#1-32 odds

Other volume problems:

- 7.1: #61-65 odds, 73
- 7.2: #61-64 odds
- 7.3: #37, 38, 41, 44
- 7.4: #66

Reflections

Complete your weekly reflection for this week's lesson. In your reflection, please complete the following in the Week 5 Reflection in "Learning Journal":

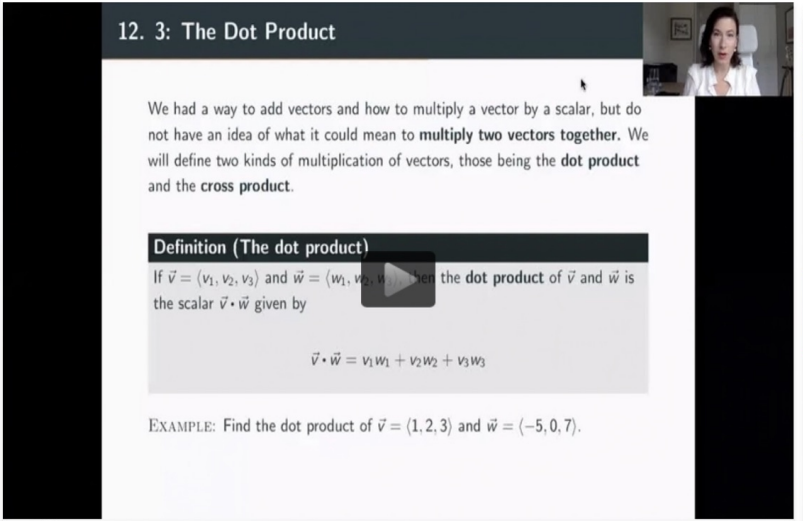
1. **Write between 250-500 words summarizing what you learned this week**. The goal is to synthesize the content and your learning from this week. To help guide your writing, please respond to the following questions:
    1. **What?** Give an objective discussion of content. What was the focus of our study? What tools did we need? What ideas were developed?
    2. **So what?** Why are these ideas useful? How can we (or did we) use them? What is challenging?
    3. **Now what?** How can you better understand the content? What problems/examples were helpful? What do you need to do more of to further your understanding? *What lingering questions do you have?*
2. Once you are done with your post, **answer one of your peer's questions from "So what?"**. If you don't have a complete answer, that's OK. The goal is to try to share some of your insight and understanding on a topic your peer (and possibly yourself) is having trouble with.

This reflection is due by **11:59pm on October 23, 2020.**

WeVu

Media
Watch & Discuss
Upload
Library
Private
Shared
Organize
Playlists
Assignments
Groups
Manage
Profile
Help & Tour
Logout

Course: MATH-211-ON1/2-202009
Playlists - Assignments - Groups: All I can view in this course (7 items)
Media: Week 2: Dot and Cross Product



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Click here and start typing to leave time-specific comments. Video will pause when you click and resume when you post the comment.

Click the post icon or press shift-enter to post the comment

Comment Map (click to unfold for more detail)

Mine
Instructor
Others

General comments on the whole video Add general comment

Mine 2 Instructor 0 Other 2

if the angle is between 0 and 90, should cosine angel bigger than 0 but less than 1?

Shanjie Xu [18:09] - 3.0 weeks ago REPLY

If the angle is between 0 and 90, we should have that cosine is between +1 and 0. Indeed, if you look at all of the triangles in the upper right quadrant of the unit circle, all of those triangles hav ...

Vanessa Radzimski [18:09] - 2.8 weeks ago REPLY

which way did we find angles, clockwise or counter clockwise?

Shanjie Xu [21:50] - 2.7 weeks ago REPLY

You find them in the same way as you would in the xy-plane (2D), so counterclockwise. It's easier to visualize the angles if you look at them in the xy-plane, yz-plane, and xz-planes, working in ...

Vanessa Radzimski [21:50] - 2.4 weeks ago REPLY

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Reflections

Complete your weekly reflection for this week's lesson. In your reflection, please complete the following in the Week 3 Reflection in "Learning Journal":

1. **Write between 250-500 words summarizing what you learned this week**. The goal is to synthesize the content and your learning from this week. To help guide your writing, please respond to the following questions:
    1. **What?** Give an objective discussion of content. What was the focus of our study? What tools did we need? What ideas were developed?
    2. **So what?** Why are these ideas useful? How can we (or did we) use them? What is challenging?
    3. **Now what?** How can you better understand the content? What problems/examples were helpful? What do you need to do more of to further your understanding? *What lingering questions do you have?*
2. Once you are done with your post, **answer one of your peer's questions from "So what?"**. If you don't have a complete answer, that's OK. The goal is to try to share some of your insight and understanding on a topic your peer (and possibly yourself) is having trouble with.

This reflection is **due** by **11:59pm on October 13, 2020.**

What? This week we learned that some anti-derivatives can't be easily recognized, but fear not! This week, we developed various techniques of integration, which we used to evaluate integrals where the anti-derivative of the inside function was not readily known.

There are 5 Techniques of Integration, this week we covered the first 3.

1.) Integration by u-substitution, 2.) Trigonometric integrals, 3.) Trigonometric substitution

This week was more about application, and here are the steps needed to use Integration by u-substitution:

1.) Look for a portion of the inside whose derivative is also there. Name that portion as your "u"

2.) Find du by taking the derivative of u and multiplying by dt

3.) Substitute u and du into the integral so that your original variable does not appear

4.) If you have a definite integral, change your limits to be in terms of u

This is the most simple technique and a good way to start these questions is to ask yourself "What do I not like?" and then try substituting a u for that value. After a few examples you'll get the hang of it in no time.

For the second technique of integration, it's similar to the first technique we discussed already, only a little more challenging with the addition of trigonometric identities. I find these the most challenging because they are not super clear on what you have to substitute just by looking at the question. The goal is still to make a u-substitution, but in certain cases, we need to do some manipulation via trig identities first. A key component to answering these questions is that we always want to isolate our future du so that our u is simple.The key to these is knowing the sin and cosine trig identity as well as the tangent and secant trig identity. Which is:

$$\sin^2(x) + \cos^2(x) = 1 \; and \; 1 + \tan^2(x) = sec^2(x)$$

There are also rules for this technique given a certain amount of sines and cosines or tans and secants.

Summary for trig integrals containing sin and cosine:

$\int \sin^{odd}(x)\cos^{n}(x)dx$ = Pluck off a single sin(x) and use the the trig identity above on the remaining sines

$\int \sin^{n}(x)\cos^{odd}(x)dx$ = Pluck off a single cos(x) and use the the trig identity above on the remaining cosines

$\int \sin^{even}(x)\cos^{even}(x)dx$ = Use the double angle formulas $\sin^2(x) = \frac{1-\cos(2x)}{2}$ and $\cos^2(x) = \frac{1+\cos(2x)}{2}$

Summary for trig integrals containing tangent and secant:

$\int \tan^{n}(x)\sec^{even}(x)dx$ = Pluck off a single $sec^2(x)$ and use the trig identity above on the remaining secants

$\int \tan^{odd}(x)\sec^{even}(x)dx$ = Pluck off a single $sec(x)tan(x)dx$ and use the trig identity above on the remaining tangents

Lastly, is the technique of Trigonometric Substitution. With these we are changing our variable from "t" to x" by using the trig identities. These are long winded questions that take a lot of your time and are easy to miss parts and make it 10x harder on yourself. After these long winded problems with simplifying and using trig identities we also want to use u-substitution again to eventually be able to solve the integral. Luckily we are given a chart to help us start the substitution process:

Trigonometric Substitution Summary

$\sqrt{a^2 - x^2}$ *Let* $x = a\sin(\emptyset)$ $1 - \sin^2(\emptyset) = \cos^2(\emptyset)$

$\sqrt{a^2 + x^2}$ *Let* $x = a\tan(\emptyset)$ $1 + \tan^2(\emptyset) = sec^2(\emptyset)$

$\sqrt{x^2 - a^2}$ *Let* $x = a\sec(\emptyset)$ $sec^2(\emptyset) - 1 = \tan^2(\emptyset)$

Overall, we are developing our brains to be able to handle more difficult integrals using these methods. Eventually we will have to not only know how to use these techniques, but also when to use each one.

So What? These ideas are useful because they give us the ability to take the anti-derivative of so many more questions. This class is starting to pick up in a hurry and we have to be prepared for whatever comes next. Trig was always my least favorite through high school, but now it's time to really practice and improve on my skills.This week was very challenging for me, especially trigonometric integrals. I found those the most challenging because you don't have a starting point thats easily found like trigonometric substitution.

Now What? To better understand the content I need to expose myself to all the different questions so I am not surprised if I see it again. The textbook problems I am finding really difficult for Trigonometric integrals and it just comes down to practice. I will continue to push through and ask for help when I need It because I have a lot of questions this week. Question 19 from the Web Work assignment was really helpful for me, since it allowed me to use all three techniques in a single question. I am curious if anyone else is finding this week as the hardest yet? If anyone has some pointers I would really appreciate it!

[redacted]id...

Tuesday, October 6, 2020 5:01:39 PM PDT

Nice post Brandon! I definitely agree that this week has been the toughest thus far. The previous weeks were the fundamentals and almost seemed like there was a "groove" that could be coming with how straight forward the FTC was and how easily simple antiderivatives could be solved. I agree that practice will be the main thing that will help, which makes it unfortunate that this isn't the only course most of us are taking, because we would surely be able to master integrals much easier if we were able to do more questions.

[redacted]aid...

Wednesday, October 7, 2020 5:22:34 PM PDT

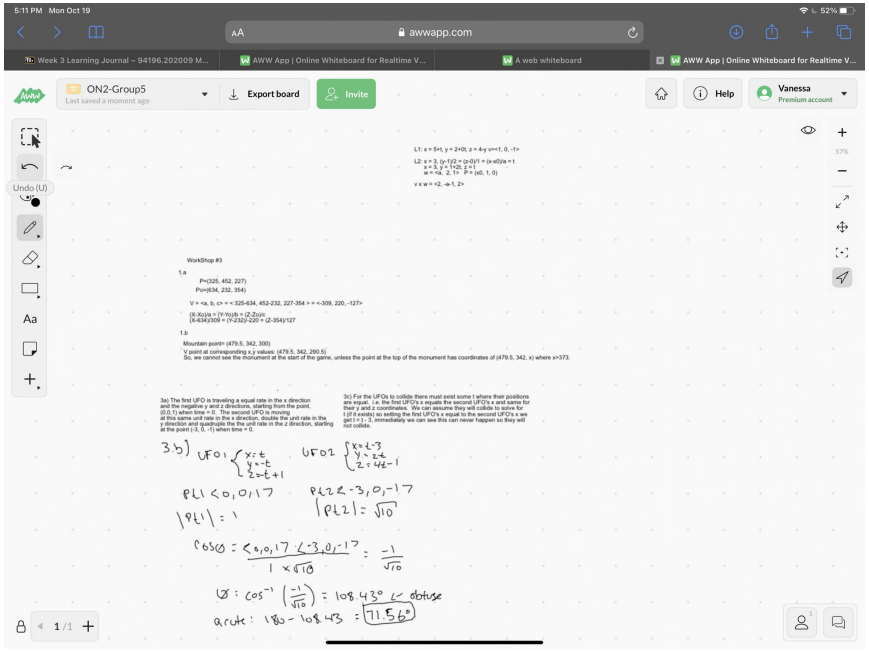
Usually picking a (let x=) u is the starting point. I think the u should be easy to derive and also has a product that can make the integral easier to solve or easier to use trig identities.

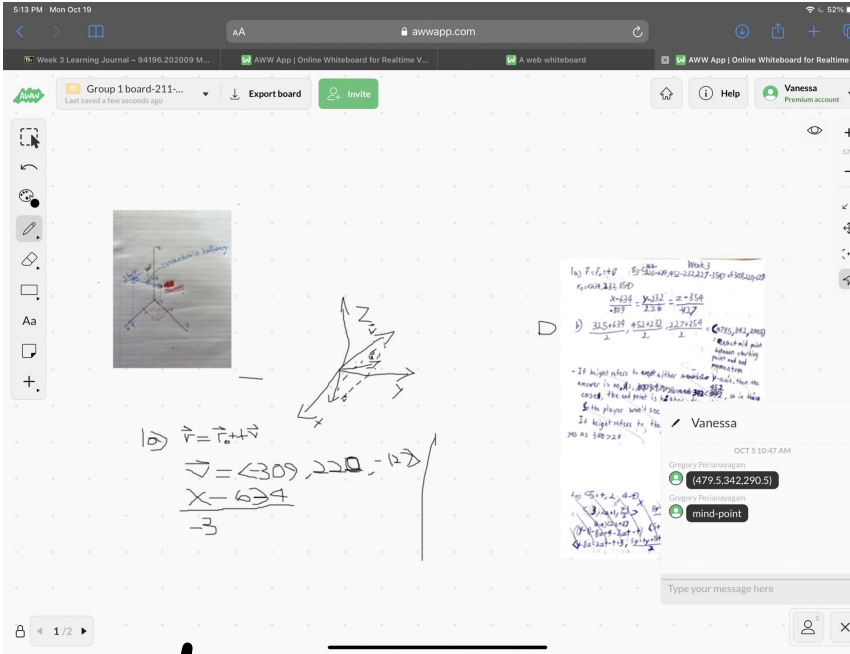
[redacted]

Thursday, October 8, 2020 5:45:04 PM PDT

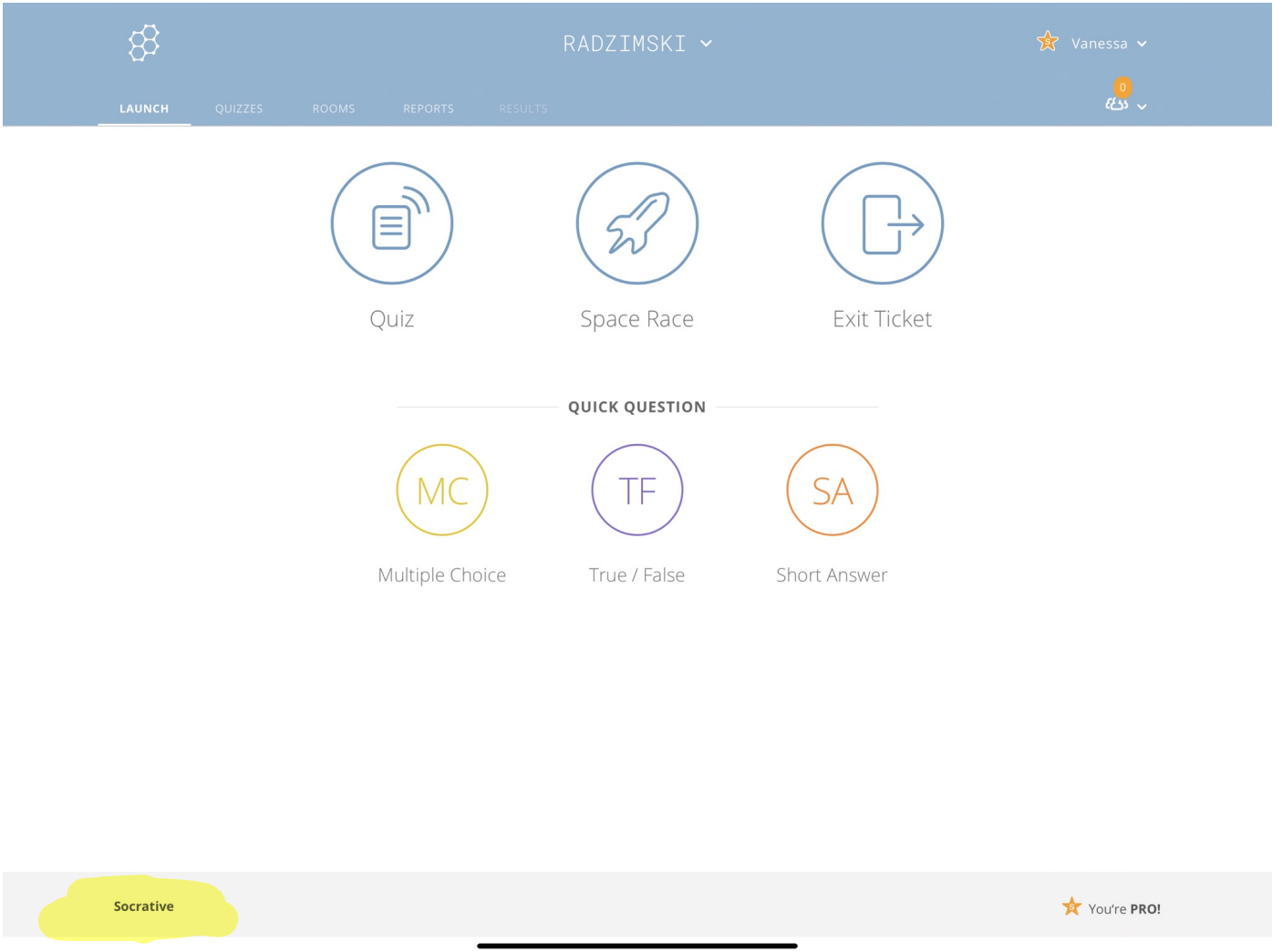
Great Post Brandon! I think a lot of us are finding this week challenging but I think by doing more problems, we gain more experience on how to set up and start certain problems where we might feel stuck. Some problems are very algebra based, and reviewing some key concepts might go a long way. I think by doing harder textbook problems and really grasping the concepts behind them will benefit us as we learn more integration techniques in the next coming weeks! Goodluck!

AWW for Collaborative Work





Worksheets are submitted as assignments after 3 workshops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LAUNCH
QUIZZES
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REPORTS
RESULTS
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Quiz
Space Race
Exit Ticket
QUICK QUESTION
MC
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SA
Multiple Choice
True / False
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