MTH 201: Calculus

Daily Preparation, Module 6A: The Chain Rule

Due by: 11:59pm ET, Tuesday, October 6

Estimated time requirement: About 45-60 minutes for the whole assignment. *If you have worked on this assignment for 30 minutes and you're not at least halfway done, DON'T work any further* — instead, *stop and ask for help* on the `#dailyprep` channel on CampusWire.

Overview

This module introduces the final and perhaps most important derivative rule we will learn in the course: **The Chain Rule**. The Chain Rule is used when taking derivatives of *composite* functions, which you'll recall are functions that are made up of two or more functions "chained" together by plugging one into the other, like $\sqrt{x^2+1}$ or $\cos(e^x)$. The commonality of composites in real applications makes the Chain Rule of primary importance as we move ahead.

What you will learn

Learning Targets addressed in this module:

- **DC.2 (CORE)**: I can compute derivatives correctly for products, quotients, and composites of functions.
- **DC.3**: I can compute derivatives correctly using multiple rules in combination.
- **DC.4**: I can compute the derivatives correctly for logarithmic, trigonometric, and inverse trigonometric functions.

BEFORE your class meeting, use the Resources for Learning (below) to learn how to do the following:

- (Review) Determine the fundamental algebraic structure of a function.
- (Review) If the fundamental algebraic structure of a function is a *composite*, determine the inner and outer functions in the composite.
- State the Chain Rule and apply it to a simple composite function.

DURING AND AFTER your class meeting, you will learn how to do the following:

- Use the Chain Rule to differentiate a composite of two basic functions.
- Differentiate a function whose derivative involves a mixture of rules (Product, Quotient, Chain, etc.)

Resources for Learning

Text: Read through Section 2.5 of the *Active Calculus* textbook. Work through the examples and all interactive exercises found at the end of the section.

Video: There's quite a bit of video to watch this time – if you watch all of these below, the complete running time is 51 minutes, 20 seconds. (You are *not* required to watch all of them — you can pick and choose, skip parts, play at 2x speed, etc. but these are here for you to learn, so don't skip just to avoid working.) You should approach these videos as if they were an entire, single class meeting of nothing but lecture and examples.

First, review the videos on composite functions and fundamental algebraic structure that were created and posted for the Functions Bootcamp assignment. You can find those on Blackboard > *Checkpoints* > *Functions Bootcamp* and then these are videos 7 and 8. Or click the links:

- (Video 7) Composites: https://gvsu.hosted.panopto.com/Panopto/Pages/Viewer.aspx?id=8742a5e1-3206-4e92-b3ac-ac240134cd86
- (Video 8) Fundamental structure: https://gvsu.hosted.panopto.com/Panopto/Pages/Viewer.aspx?id=672d8d71-903a-4965-8109-ac240134e943

Then, watch the following from the GVSUMath Calculus playlist:

- Screencast 2.5.1: Quick review - The Chain Rule (2:21) https://www.youtube.com/watch?v=HxVn6kRD5NM&list=PL9bljQJDwfGuXQHuS5Jkmum_CFILoCZX-&index=39
- Screencast 2.5.2: Example of the Chain Rule - Polynomials (4:33) https://www.youtube.com/watch?v=QDc1UmLWhug&list=PL9bljQJDwfGuXQHuS5Jkmum_CFILoCZX-&index=40
- Screencast 2.5.3: Example of the Chain Rule - Radicals (7:20) https://www.youtube.com/watch?v=ysp96e3Z-nw&list=PL9bljQJDwfGuXQHuS5Jkmum_CFILoCZX-&index=41
- Screencast 2.5.4: Chain Rule examples - Trigonometric functions (5:15) https://www.youtube.com/watch?v=4y39u0DmrPY&list=PL9bljQJDwfGuXQHuS5Jkmum_CFILoCZX-&index=42
- Screencast 2.5.5: Chain Rule examples - Exponential functions (6:01) https://www.youtube.com/watch?v=zexX6t_zbCg&list=PL9bljQJDwfGuXQHuS5Jkmum_CFILoCZX-&index=43
- Screencast 2.5.6: Chain Rule examples - Mixing rules (10:30) https://www.youtube.com/watch?v=1B06Pk3W6Pc&list=PL9bljQJDwfGuXQHuS5Jkmum_CFILoCZX-&index=44
- Screencast 2.5.7: Chain Rule examples - Graphs only (5:38) https://www.youtube.com/watch?v=pwm50foAx6A&list=PL9bljQJDwfGuXQHuS5Jkmum_CFILoCZX-&index=45

You are free to search for and use other resources in addition to, or instead of the above, as long as you can work the exercises below.

Exercises

The exercises are on Classkick, in “Module 6A Daily Prep”.

Submission, grading, and getting help

Submitting your work: Just work through the activities; your work is saved as you go.

How this is graded: Daily Prep assignments are graded on the basis of *completeness and effort*: If your submission has **all parts completed** (no blank entries, even if left blank accidentally) and **a good-faith effort to provide a correct solution or explanation is given** (no responses of “I don’t know” or “I didn’t understand”) and **the work is submitted on time**, it gets a “check”. Otherwise it gets an “x”. If you are stuck on an item, you’re expected to ask questions and give your best effort.

Getting help on this assignment: *You may work with others on this assignment, but you may not copy each others’ answers.* Evidence of copying will be treated as academic dishonesty. You may also ask questions on the #dailyprep channel on CampusWire, but you may not ask simply to be given the answers; giving and receiving answers on CampusWire will be treated as academic dishonesty.