MTH 201: Calculus

Daily Preparation, Module 7B: The Second Derivative Test and Concavity

Due by: 11:59pm ET, Tuesday, October 20

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

In this module we extend the idea of the First Derivative Test from Module 7A to accomplish the same thing but using the second derivative instead. When the second derivative of a function can be calculated easily, it gives us a simpler way to classify critical numbers as local extrema — using a procedure known as the **Second Derivative Test**. While we're thinking about second derivatives, in Module 7B we'll also learn about using the second derivative to pinpoint concavity behavior of a function's graph.

What you will learn

Learning Targets addressed in this module:

- **DA.1 (CORE)**: I can find the critical values of a function, determine where the function is increasing and decreasing, and apply the First and Second Derivative Tests to classify the critical points as local extrema.
- **DA.2**: I can determine the intervals of concavity of a function and find all of its points of inflection.

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

- (*Review*) Identify where a function is concave up or concave down by examining its graph.
- (*Review*) Given information about the sign of the second derivative of a function at a point, state whether the function is concave up or concave down at that point.

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

- Use the Second Derivative Test to determine whether a critical number of a function is a relative minimum or relative maximum.
- Use the second derivative of a function to determine its intervals of concavity and inflection points.

Resources for Learning

Text: In the *Active Calculus* text, read in Section 3.1 starting with Example 3.1.10 and continuing through the end. There is a video walkthrough for Example 3.1.10 that you should watch either just before or just after reading that example.

Video: First watch these from the GVSUMath Calculus playlist:

- Screencast 3.1.6: The Second Derivative Test (8:53) https://www.youtube.com/watch?v=4Z_lhNVXEV4&list=PL9bIjQJDwfGuXQHuS5Jkmum_CFILoCZX-&index=60
- Screencast 3.1.7: Identifying inflection points graphically (7:03) https://www.youtube.com/watch?v=Tyyo8kILvE0&list=PL9bIjQJDwfGuXQHuS5Jkmum_CFILoCZX-&index=61
- Screencast 3.1.8: Finding inflection points (7:31) https://www.youtube.com/watch?v=w_O9IKmDZMI&list=PL9bIjQJDwfGuXQHuS5Jkmum_CFILoCZX-&index=62

THEN, watch this video which is a walkthrough of Example 3.1.10 in the reading:

https://gvsu.hosted.panopto.com/Panopto/Pages/Viewer.aspx?id=544276df-e3ea-484b-9868-ac4f00ce94fd

This is also embedded on Blackboard in the *Module 7* folder.

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 this Google Form: https://bit.ly/3iGRmmk

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.