MTH 201: Calculus

Daily Preparation, Module 9A: Introduction to applied optimization

Due by: 11:59pm ET, **TUESDAY**, November 3 (Note the different date!)

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

Module 9 focuses on an important class of problems that calculus answers well, called **applied optimization** problems. These take various forms but all ask *What is the "best" value of a function that has to satisfy constraints?* For example we might want to find the maximum volume of a box if we only have a certain amount of materials present to make it; or the lowest value of the cost of producing a new product when our advertising budget is constrained. Applied optimization is the clearest application of calculus there is, and it's both the culmination of everything we've learned about derivatives and the last module we will learn about derivatives.

What you will learn

Learning Targets addressed in this module:

- **DA.3**: I can use the Extreme Value Theorem to find the absolute maximum and minimum values of a continuous function on a closed interval.
- **DA.4 (CORE)**: I can set up and use derivatives to solve applied optimization problems.

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

- (*Review*) State the **Extreme Value Theorem** and explain the three-step process it provides for finding the absolute extreme values of a continuous function on a closed interval.

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

- Given an applied setting, build a function that models the situation; identify a closed interval for its domain; then identify its absolute maximum and minimum values on the interval.

Resources for Learning

Text: In the *Active Calculus* text, read Section 3.4.

Video: In addition to these from the GVSUMath playlist, there is an insane number of videos on YouTube from other sources that give examples of applied optimization problems.

- Screencast 3.4.1: Quick review – Applied optimization (2:51) https://www.youtube.com/watch?v=llu2SZa3SYA&list=PL9bljQJDwfGuXQHuS5Jkmum_CFILoCZX-&index=69
- Screencast 3.4.2: Fencing optimization (7:09) https://www.youtube.com/watch?v=jH6J-n6zt4c&list=PL9bljQJDwfGuXQHuS5Jkmum_CFILoCZX-&index=70&t=7s
- Screencast 3.4.3: Optimization with trigonometry (13:25) https://www.youtube.com/watch?v=uJFxdxSBjok&list=PL9bljQJDwfGuXQHuS5Jkmum_CFILoCZX-&index=71

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. If you need codes, they are:

- Section 02: `5OG 4GG`
- Section 04: `IHX CMO`

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.