AEP 8: Applied Optimization

Overview

This AEP continues and completes our class work on applied optimization.

Learning Targets associated with this AEP:

- **DA.4 (CORE)**: I can set up and use derivatives to solve applied optimization problems.

Technology Background

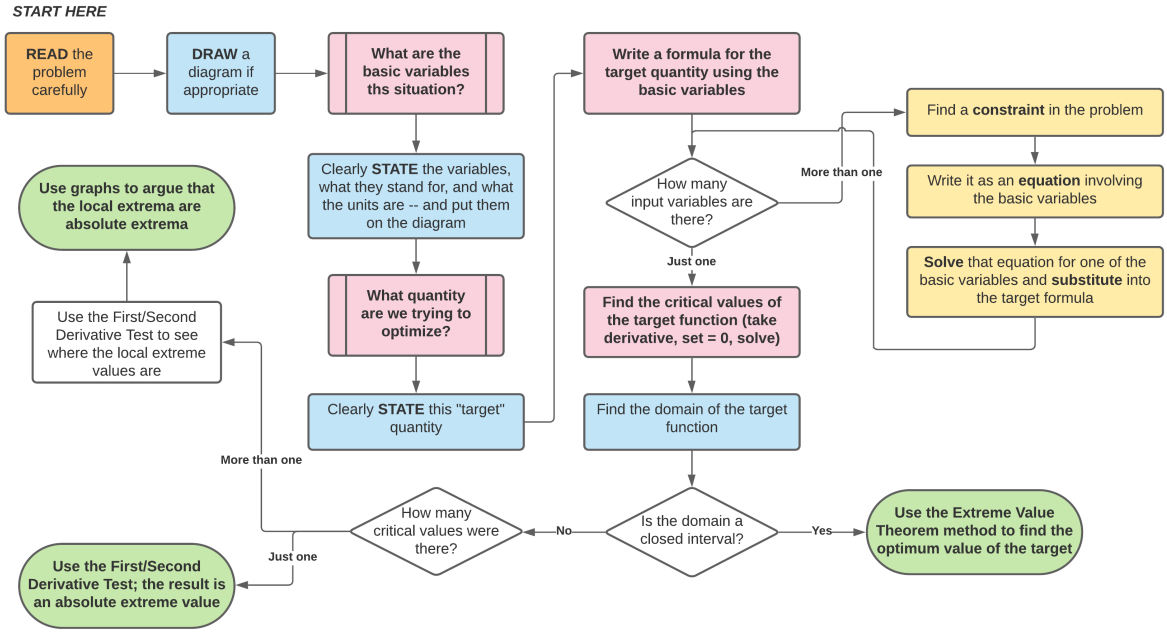
No special background needed apart from using Desmos in the usual ways.

AEP Description and Tasks

What this AEP is about

This AEP is simply continued practice and experience with setting up and solving applied optimization problems. There's not much else to say about this other than what we've already discussed in class. However, this AEP will ask you to be quite thorough in your solutions, moreso than we are in class typically. To help you with this, there are two resources available:

First, there's this flowchart for doing applied optimization. Following the steps in the flowchart will help you avoid skipping steps and leaving out information. A full-size version of this is posted where this AEP assignment is posted.



Second, on Thursday November 12, I will be posting a written solution for one of the problems from the Module 9B Followup Activity that, if turned in as an AEP, would earn an "E" grade under the grading standards at the end of this document. This will be posted in the Module 9 folder. Study it and use it as a model for what, and how, to communicate are you are doing your solution. **Pay close attention to the grading standards at the end** as they give specific requirements for how you need to write your solutions.

Tasks for this AEP

Below are two applied optimization problems you have not seen before. Your instructions are:

- If you posted any work at all for the Followup Activity for Module 9A (https://gvsu.padlet.org/talbertr5/4zhz7tpn10dfld25) then **complete the problem you posted and complete EXACTLY ONE of the new ones below**. You'll be turning in two solutions, one for your Followup Activity for 9A and one from below. **Do not attempt work on both problems below;** doing so will result in a grade of "N" and your work will be returned with no comment.
- If you *did not* post anything for the Followup Activity for Module 9A, **do both of the problems below**.

Please note, **if you did work on the Module 9A Followup, you may not choose to do another problem in its place.** You will need to complete the problem you started.

1. Bob is going on a walk and starts from his house, which is 3 miles north and one mile east of Alice's house. He walks in a straight line in a due Southeast direction. What is the closest that Bob gets to Alice's house as he walks, and where is he when this happens?
2. Two vertical poles, one 8 feet high and the other 10 feet high, stand 50 feet apart on a flat surface. We want to attach a support wire to each poles by running wire from the ground to the top of each pole. If we are to stake both wires into the ground at the same point, where should the stake be placed to use the least amount of wire?

Assignment Expectations and Grading Criteria

Standing guidelines for AEPs: AEPs are graded using the "EMRN" rubric found in the syllabus. Please note, it is the case with all AEP's that **your grade is primarily based on your explanations and writing, and only secondarily on the precision and correctness of your computations.** Correct computations with insufficient explanation will need to be revised and may receive an "N" grade.

Also, **significant incompleteness will result in a grade of "N".** This includes the following:

- **Giving answers with no explanations.** As mentioned above, you are being graded on explanations and writing, not so much on answers. Submissions that contain items where there is an answer with no explanation or insufficient explanation, will be graded "N" and returned without comment.
- Leaving items blank (even accidentally)
- Leaving large gaps in computations (skipping important steps)
- Giving only partial attempts at tasks (for example, working down to a certain point in a solution and then stopping because you need help)

Particular rules for AEP 8: Certain elements must be in place for this particular AEP in order for it to receive a grade of M or E. Skipping any of these will result in a grade of "R" or "N":

- **Your solutions must not just be computations**. There must be some English narrative, consisting of clear and correctly constructed sentences, present to guide the reader through the solution.
- **Each solution must clearly state in some way what the basic variables are, as well as what they represent and what their units are; solutions must also clearly state the target variable (the quantity you're trying to optimize) and what its units are.**
- **Each solution must produce a formula in one variable for the target quantity and show all the work that was used to arrive at that formula.** This includes identifying any constraints in the problem and how you use the constraint to simplify the target formula to one variable.
- **Each solution must use Calculus techniques to find the optimum value begin asked for.** You may not simply estimate the value from a graph or use any non-calculus alternatives, unless it's to check work that you did using calculus.
- **Each solution must include mathematical reasoning that proves that the answer you provide is truly the absolute maximum or minimum of the function you are optimizing.** For example, you might use the Extreme Value Theorem to do so. But you may not simply point to a graph.

Finally: **You are allowed to use computer tools to find derivatives and do algebraic simplification on this AEP.** For example you may use Wolfram|Alpha to find derivatives and solve equations. **If you do, you must include a link to your calculations.** You do this just by copying and pasting the URL. For example, here's a Wolfram|Alpha link to an algebra computation: https://www.wolframalpha.com/input/?i=expand+(x%2Bh)^5

Since you are allowed to use computer tools to do computations, note again that **the emphasis on AEP 8 is firmly on the quality of your solution**. It needs to be complete, neatly formatted, and readable, like a good solution in a textbook. Use the sample solution mentioned above as your guide.

Submitting your work

AEP submissions must be typewritten and saved as either a PDF or MS Word file. No part of your submission may involve handwriting; work that is submitted that contains handwriting will be graded N and returned without feedback. This includes electronic handwritten documents, for example using a stylus and a note-taking app. To type up your work, you can use MS Word or Google Docs (both of which have equation editors for mathematical notation) or any other computer-based math typesetting tool. Just make sure you save your work as a Word document or PDF (no `.odt`, `.rtf`, or other file extensions are allowed).

When you have your work typed up, double-check it for neatness, correctness, and clarity. Then, go to Blackboard, then **Assignments**, then **AEP**, then **AEP 8**. Clicking on the text "AEP 8" will take you to a place on Blackboard where you can upload your work. All grading and revisions of labs are done entirely on Blackboard. **Do not email your work to the professor** – only Blackboard submissions are accepted.

Getting Help

Please note that according to the syllabus, for AEP's **"no interactions at all with another person or with unauthorized sources on the internet is allowed."** Violations of this rule include *any* consultation with other students or former students, including Math Center tutors; using work from another student or former student; submitting the problem set to an online help site such as Chegg or Coursehero; or asking for help in an online forum. All such violations will be treated as academic dishonesty and will result in a grade of "N" and being banned from revising the work.

You **may** ask me (Talbert) for help on this assignment in the form of **specific mathematical or technical questions**. If I cannot answer a question because it would give too much away, I'll tell you so. **However please note: I will not "look over your work" before you submit it to give you feedback on the overall submission**; the expectations are clearly laid out above, so just follow those directions and submit your best work, and you'll be allowed to revise it if needed.

You can ask technology related questions to anyone at any time. For example if you need help with Desmos, or with figuring out how to type up your work, there are no restrictions on that. I recommend the `#tech` channel on Campuswire so that you'll reach a large audience.