Miniproject 6: Applied Optimization

Overview: This miniproject focuses on a central application of calculus, namely *applied optimization*. These problems augment and extend the kinds of problems you have worked with in WeBWorK and class discussions.

Prerequisites: Section 3.4 of *Active Calculus.*

This miniproject is one of the four designated CORE miniprojects. Successful completion of this miniproject with a **Mastery** rating is required to earn a C or above in the course.

For this miniproject, select EXACTLY TWO of the following and give complete and correct solutions that abide by the specifications for student work. Include a labeled picture with each solution. Full calculus justification of your conclusions is required.

Problem 1. Two vertical towers of heights 60 ft and 80 ft stand on level ground, with their bases 100 ft apart. A cable that is stretched from the top of one pole to some point on the ground between the poles, and then to the top of the other pole. What is the minimum possible length of cable required? Justify your answer completely using calculus.

Problem 2. Use calculus to find the point (x, y) on the parabola traced out by $y = x^2$ that is closest to the point $(3, 0)$.

Problem 3. Use calculus for find the maximum possible area of a right triangle under the curve

$$f(x) = x(x-4)^4$$

in the first quadrant with one corner at the origin and one side along the x-axis.

Submission instructions: The writeup that you prepare is to be saved as a PDF file and submitted using Canvas. (You may use any program you want to write the writeup but the submission *must* be a PDF, or your work will be marked at Novice level and returned without comment. You may important screenshots to show the Desmos output for any steps. Just remember to be neat with your work.)