# Guided Practice for 3.4: Applied Optimization

## Overview

In this section we come to one of the most significant applications of the derivative. Given a function that models something in real life – the temperature of a control rod, the size of a population, the value of a stock portfolio, etc. – we want to find the “best” values of that function: the lowest temperature, the highest population size, the most lucrative portfolio value. We do this by finding the absolute extreme values of a function using the tools we developed in Sections 3.1 and 3.3. So there is not much new math in this section but a lot of applying what we know to new problems that matter to important groups of people.

## Learning objectives

### BASIC learning objectives

Each student will be responsible for learning and demonstrating proficiency in the following objectives PRIOR to the class meeting.

* Read a quantitative problem carefully and identify the independent and dependent variables in the problem as well as the constraints on the variables.
* In the context of an optimization problem, identify the quantity to be optimized.
* Set up an equation to relate the quantity to be optimized to the independent variables.
* Use a constraint in the problem to reduce the equation from above down to one variable.
* Use calculus to solve a properly set up optimization problem.

### ADVANCED learning objectives

The following objectives should be mastered by each student DURING and FOLLOWING the class session through active work and practice:

* Set up and solve an optimization problem that involves calculus.

## Resources

*Reading*: **Read all of Section 3.4** and especially study the worked examples.

*Viewing*: Watch the following videos at the MTH 201 YouTube Playlist, which have a combined running time of 22 minutes, 50 seconds:

* [Quick review: Applied optimization](http://www.youtube.com/watch?v=Ilu2SZa3SYA&list=PL9bIjQJDwfGuXQHuS5Jkmum_CFILoCZX-&index=69) (2:16)
* [Fencing optimization](http://www.youtube.com/watch?v=jH6J-n6zt4c&list=PL9bIjQJDwfGuXQHuS5Jkmum_CFILoCZX-&index=70) (7:09)
* [Optimization with trigonometry](http://www.youtube.com/watch?v=uJFxdxSBjok&list=PL9bIjQJDwfGuXQHuS5Jkmum_CFILoCZX-&index=71) (13:25)

Here are some more OPTIONAL screencasts to watch, not made by GVSU faculty but nonetheless potentially valuable extra examples of applied optimization problems:

* [Optimizing the area of a rectangle inscribed in a parabola](http://www.youtube.com/watch?v=EOJbmMB8uCQ) (7:06)
* [Optimizing the surface area of a cylinder](http://www.youtube.com/watch?v=PsWsvFxwT70) (8:08) <– Audio is terrible but it *does* feature a Led Zeppelin clip, so it has that going for it
* [Maximizing profit](http://www.youtube.com/watch?v=0aDNqISovvk) (7:07)

## Exercises

All the exercises for this activity are on the web form: <http://bit.ly/2AqRSC0>.