Name	Date	

Math 10250 Activity 28: Applied Optimization Problems (Section 4.5)

GOAL: To use what we learned about optimizing f(x) on an interval to solve special word problems called optimization problems.

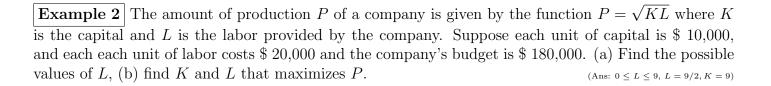
Recall the steps that we want to follow to solve a word problem:

Steps to solving word problems

- 1. Understand the problem.
 - Read the problem carefully.
 - What is given?
 - What do you want to find? (what do you want to maximize or minimize)
 - What is a reasonable estimate for the answer?
- 2. Construct a mathematical model.
 - Make a sketch, if possible.
 - Write equations, with domains, relating the unknown quantities.
- 3. Simplify the model (using substitution, etc.).
- 4. Solve simplified problem (using familiar techniques or by approximation methods).
- 5. Check your answer.

Example 1 A book publisher is designing a book whose pages have 2 inch margins on each side and 1 inch margins on the top and bottom. The publisher wants the total page area to be 200 square inches. Find the page dimensions that will maximize the **printed** area.

- a) What information do you know? Introduce any variables that help simplify this situation.
- b) Sketch and label a picture of the page described by the problem.
- c) The total page area is 200 in². Write an equation using this information.
- d) What do you want to maximize? What function will you use? On what interval do you optimize the function? (This is important for determining the method of optimization.)
- e) Now finish the problem and find the value of the variable that will maximize the area.



Example 3 Find the point on the curve $y = x^2$ $(x \ge 0)$ that is closest to the point (0, 2).

(Ans: $(\sqrt{1.5}, 1.5)$)

Example 4 A house is located at a point H in the woods, 3 miles from the nearest point A on a road. A telephone switching station is located at point B on the road, 6 miles from A. The homeowner wants to run a telephone cable through the woods from B to B (where B is a point between B and B) and then along the road from B to B. The cost of laying the cable through the woods is three times as expensive per mile as it is along the road. Where should the point B be chosen to minimize the cost?