

ASSIGNMENT 2 · 9: Section 002

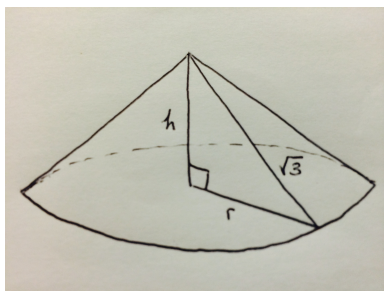
There are two parts to this assignment. The first part is on WeBWorK — the link is available on the course webpage. The second part consists of the questions on this page. You are expected to provide full solutions with complete arguments and justifications. You will be graded on the correctness, clarity and elegance of your solutions. Your answers must be typed or very neatly written. They must be stapled, with your name and student number at the top of each page.

In the following take great care when setting up the problems. Use the following steps as a guide.

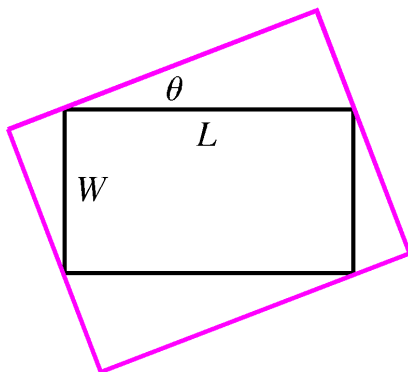
- Understand the problem. Read the problem carefully. Try to draw a picture or think about some examples. Get a feel for what the relevant quantities are, how the quantities can change and what constraints are present.
- Introduce notation for the relevant quantities. Identify the quantity to be optimized.
- Find relationships between the variables.
- Find an equation for the quantity to be optimized as a function of a single variable on some suitable domain.
- Do Calculus. Use techniques from the course to find the absolute maximum or minimum as required. For example, if you are working with a continuous function on a closed interval consider using the closed interval test.
- Reflect. Take some time to think about your answer. Is it reasonable?

Questions:

1. A right triangle of hypotenuse $\sqrt{3}$ is revolved about one of its legs to create a right circular cone. Find the radius, height, and volume of the cone of greatest volume.



2. Find the maximum area of a rectangle that can be circumscribed about a given rectangle of length L and width W . *Hint:* One way, but not the only way, to do this is to consider the area of the large rectangle as a function of the angle θ shown below.



3. The sound level measured in watts per square meter, varies in direct proportion to the power of the source and inversely as the square of the distance from the source. So the sound level S is given by

$$S = kPd^{-2}$$

where P is the source power, d is the distance from the source, and k is a constant greater than zero.

Two people in my neighborhood decided to throw parties on the same day, 200 meters apart, and are both blasting music on their stereos. The first party has 45 times as much power as the second. If I stand on the line segment between the two parties, where should I go if I want my surroundings to be as quiet as possible? What if I can stand outside the line segment connecting the two parties?