

Optimization Problems

(covers Stewart 4.7)

In optimization problems, the goal is to *maximize* or *minimize* something (like volume, area, cost, ...).

Optimization problems take practice, but the steps are similar. Here are the basic ones:

1. Draw a diagram. (Often a coordinate system will help.)
2. Create function that you want to optimize.
3. Find an equation to help rewrite function in one variable.
4. Find absolute max/min for that function using derivatives.

Ex 1.

Find the area of the largest trapezoid that can be inscribed in a circle of radius 1 and whose base is a diameter of the circle.

Ex 2.

You have been asked to design a 1000-cm^3 can shaped like a right circular cylinder. What dimensions will use the least material?

Ex 3.

Find the point on the parabola $y^2 = 2x$ that is closest to the point $(1, 4)$.

Ex 4.

A right circular cylinder is inscribed in a cone with height h and base radius r . Find the largest possible volume of such a cylinder.