

## Optimization Problems

(covers Stewart 4.7)

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

**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  $1000\text{-cm}^3$  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.

Optimization problem 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 want to optimize.
3. Find an equation to help rewrite function in one variable.
4. Find absolute max/min for that function using derivatives.