Optimization

Math 1A, section 103

April 1, 2014

0. (Warmup.) Find the minimum value of $x + y$ given that $y = x^2$.

1. A manufacturing company is designing a cylindrical aluminum shape for a can of beans. Given that they want to use at most $300cm^2$ of aluminum per can, what height should the cans be so as to maximize the volume of each can of beans? You may use a calculator to approximate your answer.

2. A cone-shaped drinking cup is made from a circular piece of paper of radius r by cutting out a sector (like a pizza slice) and joining the edges of the cut. Find the maximum capacity of such a cup, in terms of r.

3. There is a river running west-to-east, located 2 miles south of Sally's farm. Her grandmother's house is 1 mile north of the river, and 3 miles east of Sally's house. Sally wants to walk to her grandmother's house but stop at the river along the way. What is the shortest possible distance her path can be? (Assume there are no obstacles or other houses in the way.)

4. A steel pipe is being carried down a hallway 9 ft wide. At the end of the hall there is a right-angled turn into a narrower hallway 6 ft wide. What is the length of the longest pipe that can be carried horizontally around the corner?