Optimization & Modeling

MA1161 Spring 2007

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1. A wire of length L is cut into two pieces. (We allow the possibility that one of the pieces has zero length.) The first piece is bent into a circle, the second into a square. How long should the piece of wire that is bent into a circle be in order to maximize the sum of the areas of the two shapes?

2. A rectangular building is to cover 20,000 square feet. Zoning regulations require 20 foot frontages at the front and the rear and 10 feet of space on either side. Find the dimensions of the smallest piece of property on which the building can be legally constructed.

3. The regular air fare between Boston and San Francisco is \$500. An airline flying 747s with a capacity of 380 on this route observes that they fly with an average of 300 passengers. Market research tells the airlines' managers that each \$20 fare reduction would attract, on average, 20 more passengers for each flight. How should they set the fare to maximize their revenue?

4. Daily production levels in a plant can be modeled by the function $G(t) = -3t^2+12t-12$ which gives units produced at t, the number of hours since the factory opened at 8am. A what time during the day is the factory productivity at a maximum?