MA 104
Due: 3 June 2008 at 0800
Homework

For many math problems, the process of solving the problem is more important than the answer. This is especially true for optimization problems. If you work through the correct process, you will get the right answer as a consequence. This assignment is intended assess your ability to work through the process of solving optimization problems. The answers are included with the problem to help you evaluate your own solution. You must use calculus to solve each of these problems.

---

1. Let $f(t)$ be the temperature at time t where you live. Describe what the tempurature is doing in each case?

   (a) $f'(3) = 2, f''(3) = 4$
   (b) $f'(3) = 2, f''(3) = -4$
   (c) $f'(3) = -2, f''(3) = 4$
   (d) $f'(3) = -2, f''(3) = -4$

2. Find the points on the ellipse $4x^2 + y^2 = 4$ that are farthest away from the point $(1, 0)$.

   Answer: $\left(-\frac{1}{3}, \frac{-\sqrt{32}}{3}\right)$ and $\left(-\frac{1}{3}, \frac{-\sqrt{32}}{3}\right)$

3. A cylindrical can without a top is made to contain 150 cm^3 of liquid. Find the dimensions that will minimize the amount of metal to make the can.

   Answer: radius = 3.62 cm and height = 3.62 cm

4. If 1200 cm^2 of material is available to make a box whose rectangular base has one side 3 times that of the other and no top, find the largest possible volume of the box.

   Answer: Volume = 486, 728 cm^3

5. During the summer, you sell snow cones near the beach. Last summer, you sold snow cones for \$1 each and sold about 20 per day. When you increase the price by 10 cents, you find that your sales decrease by two per day.

   (a) Find the demand function, assuming that it is linear; (i.e., the equation of price as a function of quantity sold.)
   (b) If the materials for making the snow cones cost you 60 cents, what should you be selling your cones for to maximize profit?

   Answer: price = \$1.30