Supplement to Homework 2

Due Wednesday, January 19

Complete each of the problems below. Remember to show all of your work.

1. A can is to be made to hold 1 Liter (L) of oil. We would like to minimize the cost of metal used to make the can.

    (a) Give an equation for the surface area of a cylinder with a bottom, but no top piece.

    (b) What is the volume of a cylinder with radius r and height h?

    (c) What is the smallest area of metal that we can use to make a can that holds 1 L of oil?

2. In this problem, we need to find the area of the largest rectangle that can be inscribed in a semicircle of radius 5.

    (a) Draw a picture to represent this. Draw a line segment from the origin (center of circle) to a corner of the rectangle.

    (b) How long is this line segment?

    (c) What is the height of the rectangle in terms of the length (x) of the line segment and the angle (θ) it makes with the positive x-axis?

    (d) What is the width of this rectangle?

    (e) What is the area of the rectangle, in terms of θ?

    (f) What is the area of the largest possible inscribed rectangle?

3. For each of the cost functions shown below, find (i) the cost, (ii) the average cost, and (iii) the marginal cost of producing 1000 units.

    (a) $C(x) = 10,000 + 25x + x^2$

    (b) $C(x) = 2\sqrt{x} + \frac{x^2}{8000}$