Math 125 Carter Test 3 Spring 2003

General: Do all your work and write your anwsers inside the blue book. Do not write on the test. Write your name on only the outside of the blue book. Show me what you know about how to work the problem! Each problem is worth 20 points. Good luck!

1. Sketch the graph of the function

$$f(x) = x^2 + \frac{2000}{x}.$$

   A similar function is involved in minimizing the surface area of a box subject to the condition that it holds a fixed volume. Here I want you to indicate: (1) all local optima, (2) all vertical asymptotes, (3) concavity information, (4) "long-term" behavior.

2. A cylinder of radius 5 centimeters is being filled at a rate of 3 cubic centimeters per second. How fast is the height increasing when the height is 10 centimeters.

3. A spherical planet that is made of ice is loosing volume at the rate of 200 cubic kilometers per year because it is too close to its sun. At what rate is the radius decreasing when the radius is 4000 kilometers?

4. Compute the limit

$$\lim_{x \downarrow 0} x \ln(x).$$

5. Find the area of the rectangle that has maximal area among all of those which are inscribed with one vertex at $(0, 0)$, and opposite vertex in the first quadrant along the line

$$y = 4 - 6x.$$

   In this way the west side of the rectangle is along the y-axis, and the south is along the x-axis.