↑↑ Last Name ↑↑ , ↑↑ First Name ↑↑

Math 163A Homework Set #6

Due Friday, May 30, 2008

Problem:	1	2	3	4	5	Total
Score:						
Possible:	5	5	5	5	5	25

[1] (similar to suggested problem 6.1#15)
The goal is to find the absolute extrema of $f(x) = -x^4 + 8x^2 - 9$ on the interval [-3,4].

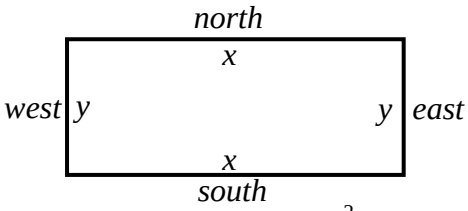
(a) Find the critical numbers of f. Show your work clearly.
(b) Make a table showing the list of important *x*-values and the corresponding *y*-values. (The important *x*-values are the two endpoints and all critical numbers that are in the interval.) Show your work.
(c) Based on your table, write a concluding sentence presenting the points that are the absolute extrema.

[2] (similar to suggested problems6.1#19) The goal is to find the absolute extrema of $f(x) = -\dfrac{x}{x^2+25}$ on the interval [0,10]. Answer the same questions (a)-(c) from problem [1].

[3] (similar to suggested problem 6.1#27) The goal is to find all relative or absolute extrema of the function $f(x) = x + \dfrac{1}{x}$ on the interval $(0,\infty)$. Note that because the interval is not closed, we have to work harder.

(a) Find $f'(x)$ and determine the critical numbers of f. (Hint: There are two.) Show your work.
(b) We are only interested in the interval $(0,\infty)$. One of your critical numbers should be within this interval. Using the technique of substituting sample numbers into $f'(x)$, determine where f is increasing or decreasing on this interval. Show your work and present your results clearly.
(c) Based on your analysis from part (b) explain why the critical number in the interval $(0,\infty)$ is a relative extremum, and say what type. (Remark: Your work in (b) and (c) is essentially the 1st derivative test.)
(d) Explain why the critical number in the interval $(0,\infty)$ is actually an absolute extremum on the interval $(0,\infty)$, and say what type.

[4] (similar to suggested problem 6.2#13) A fence must be built to enclose a rectangular area of 20,000 m^2. Fencing material costs \$3 per foot for the two sides facing north and south, and \$6 per foot for the other two sides. The goal is to use calculus to find the dimensions and the cost of the least expensive fence.



(a) Write an equation involving *x* and *y* that expresses the fact that there is the area is 20,000 m^2. Call this *Equation I*.
(b) Write an equation involving *x* and *y* and the total cost *C*. Call this *Equation II*.
(c) Solve *Equation I* for *y* in terms of *x*. Call this the new *Equation I*.
(d) Substitute *Equation I* into *Equation II* and simplify to get a new equation that gives the total cost *C* as a function of just one variable *x*. Call this function $C(x)$. Show your work.
(e) Using calculus, find the value of *x* that minimizes $C(x)$. Show your work.
(f) Find the corresponding values of *y* and the resulting cost, C. Show your work.

[5] (similar to suggested problem 6.2#23) An open box is to be made by cutting a square from each corner of a 6 ft by 6 ft sheet of cardboard then folding up the sides. What size square should be cut from each corner to produce a box of maximum volume? What will be the dimensions of the box and its volume