Department of Mathematics

WISCONSIN LUTHERAN COLLEGE

EXAM 3

MAT 221

Name _____

November 11, 2011

- You have 50 minutes to complete the exam.
- Partial credit will be given so you must SHOW ALL OF YOUR WORK. Put all of your work and answers in the space provided. Scratch paper is not allowed.
- Place your books, notebooks, etc. on the floor. The only items on your desk should be this exam and pencil/eraser/pen. Calculators are not allowed.

Problem	Points	Points per part	Points Earned
True-False	10	2	
1	10		
2	8		
3	15	6,6,3	
4	10		
5	12		
6	12		
7	8		
8	15		
TOTAL	100		

Please circle your section:

8:00 Friske

1:30 Friske

I. True – False

T F a. If $f''(x)$ is negative on an interval I, then f is concave upward on I.

T F b. The relative extrema of a function f defined on an interval (a, b) occur at critical points of f.

T F c. If $f''(a) = 0$ then $x = a$ is an inflection point of f.

T F d. The extreme value theorem implies that $f(x) = \frac{3x-2}{\sqrt{1-x}}$ attains an absolute maximum at some x in the interval $[0, 2]$.

T F e. The first derivative test is used to check if a critical point is a relative max or min.

II. Concepts

1. Find the critical points of $f(x) = \sqrt{9 - x^2}$. _____

2. Does $f(x) = \frac{3x^2+1}{-4x^2+x-2}$ have any horizontal asymptotes? If so, give their equations. If not, explain why.

3. For the function $f(x) = x^3 - 3x^2 + 3$ find

   (a) The open intervals on which f is
   increasing _____ decreasing _____

   (b) The open intervals on which f is
   concave upward _____ concave downward _____

   (c) All inflection points _____ (If none, write "none" in the blank.)

4. Find all values of x at which $f(x) = (x^2 - 4)^{2/3}$ has a relative extremum and determine if each is a maximum or minimum.

5. Sketch the graph of a function f having the following properties on the axes provided.

(a) $f(-3) = -4$, $f(4) = 7$

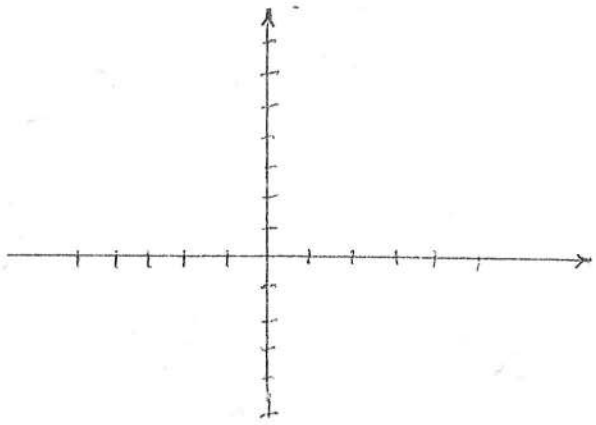
(b) $f'(x) < 0$ on $(-\infty, -3)$ and $(4, \infty)$

(c) $f'(x) > 0$ on $(-3, 4)$

(d) $f'(-3)$ is undefined

(e) $f''(x) > 0$ on $(1, 3)$

(f) $f''(x) < 0$ on $(-\infty, -3)$, $(-3, 1)$, and $(3, \infty)$



6. Use differentials to approximate $\sqrt{9.12}$.

7. Explain precisely what the mean value theorem concludes about the function $f(x) = \sqrt[3]{x}$ on the interval $[-1, 8]$.

8. A rancher has 200 feet of fencing to enclose two adjacent rectangular corrals (see diagram below). What dimensions should be used for the corrals to enclose the most area?