Math 115 Line 22709 Exam 2 Nov. 15, 07

Name: _____ **I.D.** _____

1. (10 points) True or False problems (circle your answer)

   (i) If $x = c$ is a critical point of $f(x)$, then $f'(c) = 0$. T F

   (ii) If $f(c)$ is a relative extrema of $f(x)$, then $x = c$ is a critical point of $f(x)$. T F

   (iii) If c is a critical point of $f(x)$, then $f(c)$ may not be an absolute extrema. T F

   (iv) If $f''(c) = 0$, then $(c, f(c))$ is an inflection point. T F

   (v) Any continuous function on $(0, 1)$ must have an absolute minimum and an absolute maximum on $(0, 1)$. T F

2. (10 points) Determine the horizontal and vertical asymptotes of $f(x) = \dfrac{1 - 3x^2}{x^2 - 3x + 2}$.

3. (10 points) Solve for x where $\ln(x + 1) + \ln(x + 6) = \ln x + \ln 12$.

4. (10 points) Find the derivatives of

$$(a). \quad f(x) = xe^{x^2-1} \qquad (b). \quad g(x) = \ln \frac{(x-1)^7\sqrt{x+1}}{x^2+1}.$$

5. (10 points) Use the 2nd-D Test to determine the relative extrema of the function

$$f(x) = x^3 - 6x^2 - 15x + 2.$$

6. (10 points) Let $f(x) = xe^x$. Find the intervals of increasing and decreasing of f and the relative extrema of f.

7. (10 points) Let $f(x)$ be the function in Problem 6. Find the intervals of concavity of f and the inflection points of the graph of f.

8. (10 points) Find the absolute extrema of $f(x) = 3x^{2/3} - 2x$ on the interval $[0, 8]$.

9. (10 points) A rectangle region is to be enclosed with a fence of total length 20 feet. Find the length x and the width y of the rectangle that has the maximal area.

10. (10 points) A right circular cylinder of volume 40π cubic feet is to be constructed. If the material for the base and the top costs 5 dollars per square feet, and the material for the side costs 2 dollars per square feet. Determine the radius and height of the cylinder to minimize the cost.