11-11:50am

Midterm Exam 2

Fall 2012 Math 0220

100 points total **Your name:** _____

No calculators, no notes, no books. Show all your work (no work = no credit). Write neatly. Simplify your answers.

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1. [10 points] Find $(f^{-1})'(2)$ if $f(x) = x^5 - x^3 + 2x$. [Hint: $f(1) = 2$].

2. [15 points] Use logarithmic differentiation to find y' if $y = \dfrac{\sqrt{x}\, e^{3x}}{(x^3 - x)^9}$.

3. [15 points] A puppy weighs 2 pounds at birth and 4 pounds two months later. If the weight of the puppy during its first 6 months is increasing at a rate proportional to its weight, then how much will the puppy weigh when it is 5 months old? Simplify your answer.

4. [15 points] Verify that the function $f(x) = \dfrac{x}{x+1}$ satisfies the hypotheses of the MVT on the interval $[0, 8]$. Then find all numbers c that satisfy the conclusion of the MVT.

5. [15 points] For the function $f(x) = \dfrac{x^2 - 1}{x}$ find its domain, intervals and types of concavity.

6. [15 points] A rectangular box with a square base and no top is to have a volume of 4 cubic inches. Find the dimensions for the box that require the least amount of material.

7. [15 points] For the equation $x^2 = 6$ use Newton's method with the initial approximation $x_1 = 2$ to find the third approximation x_3 to the positive root.

bonus problem [10 points extra] Does there exist a differentiable everywhere function f such that $f(1) = 10$, $f(5) = -3$, and $f'(x) \geq -3$ for all x?