Name: _____ ID#: _____

Midterm II

Math 1a
Introduction to Calculus

April 18, 2005

Show all of your work. Full credit may not be given for an answer alone. You may use the backs of the pages or the extra pages for scratch work. Do not unstaple or remove pages.

This is a non-calculator exam.

> *Students who, for whatever reason, submit work not their own will ordinarily be required to withdraw from the College.*
>
> —*Handbook for Students*

Problem Number	Possible Points	Points Earned
1	20	
2	25	
3	15	
4	15	
Total	75	

1 1

1. (20 Points) Find the following derivatives:

(i) $\dfrac{d}{dt}\sin^3\left(\dfrac{2}{t}\right)$

(ii) $\dfrac{d}{d\theta}\ln(\sec^2\theta)$

1 **1**

(iii) $\dfrac{dy}{dx}$, where $xy + 2x + 3y = 1$ (your answer should involve x and y).

(iv) $\dfrac{d}{dx} 2(x^2 + 1)^{x/2}$

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2. (25 Points) We are going to graph completely the function

$$f(x) = \frac{3}{4}x^{1/3}(x-4).$$

(a) Find the domain of f.

(b) Find the places where f is positive, negative, or zero.

Positive on : _____

Negative on : _____

Zero at: _____

(c) Find all horizontal and vertical asymptotes (if any) of the graph of f.

(d) The derivative of f is

$$f'(x) = x^{-2/3}(x-1).$$

Find the intervals of increase or decrease.

Increasing on : _____

Decreasing on : _____

(e) Find any local maxima or minima.

(f) The second derivative of f is

$$f''(x) = \frac{x+2}{3x^{5/3}}.$$

Find the intervals of concavity.

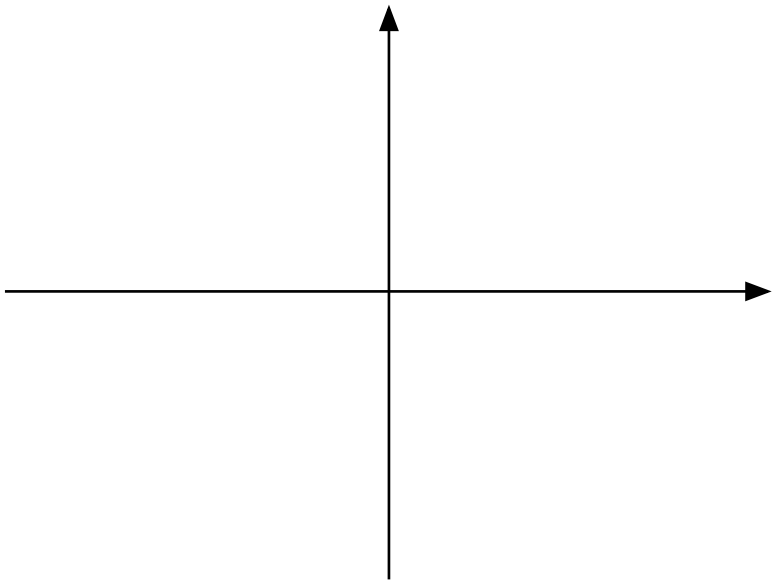
Concave up on : _____

Concave down on : _____

(g) Find any inflection point(s).

2 **2**

(h) Sketch the graph of f. Label all significant data–zeroes, asymptotes, local extrema, inflection points



(i) Find the global minimum and maximum, if they exist.

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3 3

3. (15 Points) A highway patrol plane flies 3 miles above a level, straight road at a steady 120 miles per hour. The pilot sees an oncoming car and with radar determine that at the instant the line-of-sight distance from plane to car is 5 miles, this distance is decreasing at the rate of 160 miles per hour. Find the car's speed along the highway.

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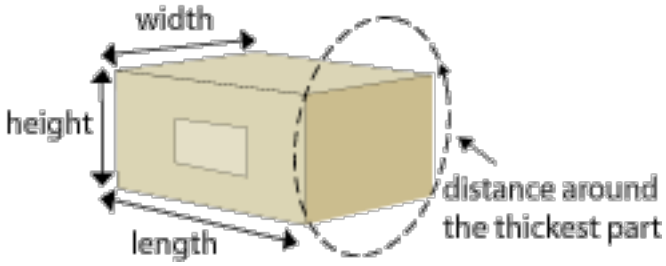
4 4

4. (15 Points) the U.S. Postal Service will accept a box for domestic shipment only if the sum of its length and girth (distance around) does not exceed 108 inches.



What dimensions will give a box with a square end (width and height are the same) the largest possible volume? Make sure you check that you have found the largest possible volume, not the smallest!

_____ / 15

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