Math 106–Section 450 (Prof. Rammaha) **Your Name:**____________________________
Exam 2
10/30/2008 **TA Name:**____________________________

You must show all of your work to receive full credit!

No.	1	2	3	4	5	6	Total
score							

(1) (8 points) Suppose that f is a continuous function on $\mathbb{R}$ with $f(7) = 1$ and $f'(7) = \frac{3}{2}$. Use linear approximation to estimate $f(7.04)$.

(2) (12 points) Let $f(x) = x^3 + 4x - 7$, $x \in \mathbb{R}$.
(a) (4 points) Show that its inverse function f^{-1} exists.

(b) (8 points) Find the equation of the tangent line to $y = f^{-1}(x)$ at the point $(9, 2)$.

(3) (24 points, 8 points each) Find $\frac{dy}{dx}$ if (You need not simplify):

(a) $y = x^3 \arctan(\sqrt{x})$

(b) $y = \left(\sin^{-1}(4x) + \ln|1 - \cos x|\right)^9$

(c) $x^3 e^y + \sec^{-1} y = 9x$

(4) (8 points) Assume that an infected area of injury is a square. Without medical treatment, the infected area started to increase at the rate of 0.8 cm^2/day. At what rate is the length of the infected area increasing when the length is 4 cm?

(5) (24 points) This question deals with the function $f(x) = 3x^5 - 5x^3 + 1$.

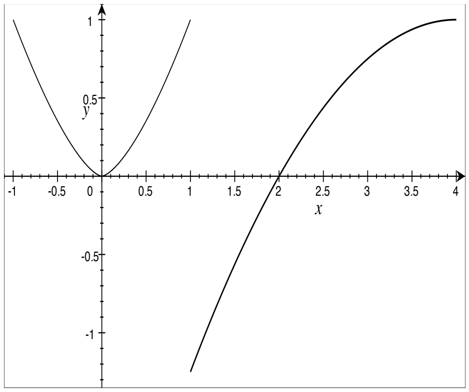
(a) (6 points) Find all critical points of f.

(b) (6 points) Find the global (absolute) maximum and minimum values of f on the interval $[-\frac{1}{2}, 2]$.

(c) (8 points) Find all inflection points of f and determine the open intervals on which f is concave up, concave down.

(d) (4 points) Find the linearization of f at $x = 2$.

(6) (24 points)
Given that $y = f(x)$ is a continuous function on the interval $[-1, 4]$ with $f(0) = 0$ and whose **derivative function** $y = f'(x)$ is as shown below



(a) (9 points) **Find** and **classify** all of the critical points for the function $f(x)$ in the interval $[-1, 4]$.

(b) (8 points) Determine the intervals on which f is concave up and down, and list all inflection points for the function $f(x)$.

(c) (7 points) In the space next to the graph of $y = f'(x)$, sketch a reasonable but **correct** graph of $y = f(x)$. Make sure to highlight all important features of the graph.