Math 106–Section 450 (Prof. Rammaha) **Your Name:**________________________
Exam 2
10/31/2013 **TA Name:**________________________

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

No.	1	2	3	4	5	6	Total
score							

(1) (10 points) Find the linearization of $f(x) = \sqrt{2x+7}$ at $x = 1$; and use it to approximate $\sqrt{9.2}$.

(2) (16 points) Let $f(x) = 3x^5 - 20x^3 + 1$.
(a) (8 points) Find all critical points of f.

(b) (8 points) Find the global (absolute) maximum and minimum values of f on the interval $[-1, 2]$.

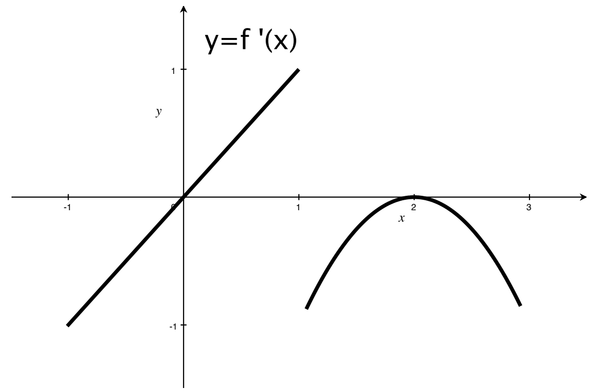
(3) (12 points) Let $f(x) = x^3 + 2x - 2$.

(a) (6 points) Show that $y = f^{-1}(x)$ exists.

(b) (6 points) If $y = f^{-1}(x)$ find $\frac{dy}{dx}$ at the point (10, 2).

(4) (10 points) Does there exist a differentiable function f on $(0, \infty)$ with the properties: $f(1) = 1$, $f(2) = 3$, and $f'(x) = \sqrt{3 + \ln x}$, for all $x \in (0, \infty)$? An answer such as "Yes" or "No" alone is not sufficient and will receive no credit. You need to justify your answer. (Hint: The Mean Value Theorem).

(5) (30 points) Given that $y = f(x)$ is a continuous function on the interval $[-1, 3]$ whose **derivative function** $y = f'(x)$ is as shown below.



(a) (12 points) **Find** and **classify** all of the critical points for the function $f(x)$ in the interval $[-1, 3]$.

(b) (10 points) Determine the intervals on which f is concave up, concave down, and list all inflection points for the function f.

(c) (8 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.

(6) (22 points) A farmer wants to build a three-sided fence next to a straight river, which forms the fourth side of a rectangular region whose area is 500 square meters. The cost of fencing for the side parallel to the river is \$20 per linear meter, and the cost of fencing for the other two sides is \$25 per linear meter. Find the dimensions of the rectangular region that has the least cost of fencing.