Math 106-Sec 45X Fall '04 **Exam 2** **Score:** _____

Name: _____ **TA's Name:** _____

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score							

Instructions: You must show supporting work to receive full and partial credits. No text book, notes, formula sheets allowed.

1(16pts) (8 points each) Find $\frac{dy}{dx}$ for each of the functions. (**Do not simplify wherever not necessary!**)

(a) $y = \dfrac{x^2 + \tan x^2}{e^x + \ln(x^2+1)}$

(b) $y = \sqrt{x + \sqrt{x+1}}$

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2(16pts) (a) Find the exact values of all critical points of the function $f(x) = (ex^2 + x)^{2/3}$. (Note: If your answer has π in it, then 3.14... will not be accepted in its place as the exact value, and the answer will be counted wrong.)

(b) Use the first derivative test to determined the intervals in which the function is increasing and decreasing, and to determine all the local extrema.

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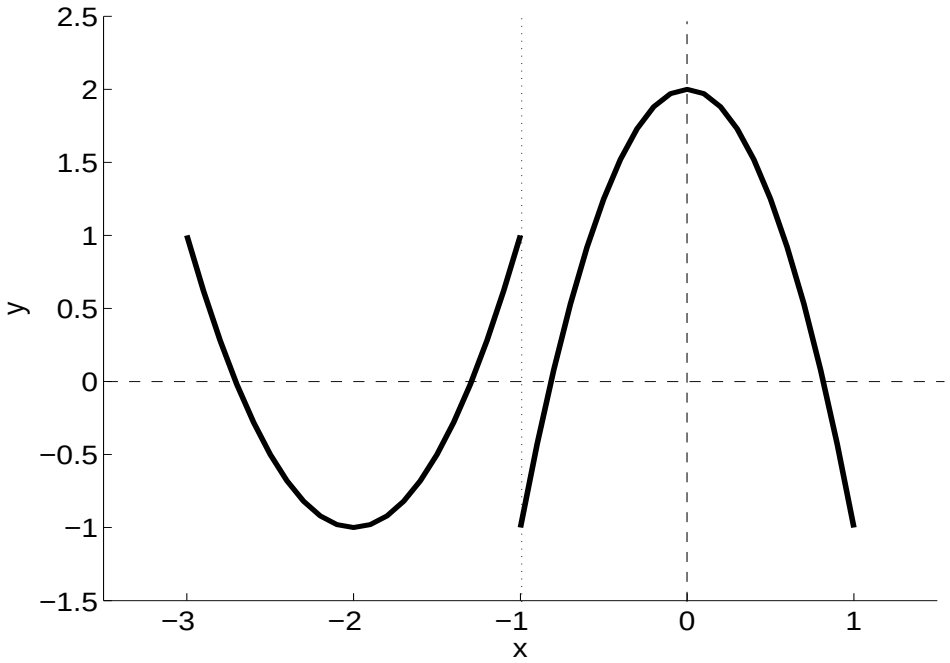
3(6pts) Sketch a graph of the function satisfying these properties: $f(1) = 0,\ f'(1) = 0,\ \lim_{x\to\infty} f(x) = 2, f'(x) < 0$ for $-1 < x < 1$, $f'(x) > 0$ for $x > 1$ and $x < -1$, and $\lim_{x\to -1^+} f(x) = +\infty$.

4(10pts) (a)(6pts) The derivative $f'(x)$ of a function $f(x)$ on an interval is shown below. **Find** all the critical points in the interval by labelling them on the graph as $a, b, c, ...$, etc. and then **classify** them by the First Derivative Test.



(b)(4pts) On the same graph, sketch a plausible graph of $y = f(x)$ featuring all important elements of the function and $f(-3) = 0$.

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5(16pts) Find the absolute extrema of the function $f(x) = x^{3/4} - 4x^{1/4}$ in the interval $[1, 2]$. (Show all the works.)

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6(18pts) (a)(12pts) Find an equation of the tangent line to the curve defined by the equation $x^3+x^2y^3 = x+3y$ at the point $(-1, 0)$.

(b)(6pts) Use the linear approximation to estimate the value $f(2.1)$ given the following information:

x	1.9	1.95	2
$f(x)$	10.3	10.7	11.0

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7(12pts) Find limits:

(a) $\lim_{x\to 0} \dfrac{e^x - 1 - x}{x^2}$

(b) $\lim_{x\to 1^+} \dfrac{\sin x}{x^2 - 1}$

8(6pts) Find the value of $g'(1)$ if $g(x) = \sin^2(f(2x+1))$ and $f(3) = \pi/4, f'(3) = -1$.

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2 Bonus Points: True or false: The custom of serving Fortune Cookies in Chinese restaurants came from China. (*... The End*)