Math 108 – Calculus I Midterm 2 Practice 11/10/2010

▶ **Print your name here:**_____

▶ **Please circle your section:**

(1)	T 1:30	Gilman 17	Ariturk, Sina
(2)	T 3:00	Hodson 210	Tran, Timothy
(3)	Th 1:30	Maryland 309	Ravit, Jason
(4)	Th 3:00	Hodson 316	Tran, Timothy

▶ **Write out and SIGN the pledge:**

I attest that I have completed this exam without unauthorized assistance from any person, materials, or device.

Grading
1
2
3
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Total:

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Signature: Date:

▶ This is a 50 minutes in-class closed book exam. No notes, books, or calculators are allowed.

▶ This examination booklet contains 4 problems, on 6 sheets of paper including the front cover. Please detach the last page, which is intended for use as scrap paper.

▶ Show all work. Don't use any techniques that haven't been covered in class yet. The correct answer is worth no points without any argumentation.

1 (30 pts.) Find the derivatives $f'(x)$ of the following functions $y = f(x)$.

a) $f(x) = \frac{x^2+\sin x}{\cos x}$

b) $f(x) = \ln(\sqrt{x^2+1})$

c) $f(x) = (\sin x)^x$ $(x \in (0, \pi))$

2 (20 pts.) Evaluate the following limits.

a) $\lim_{x\to\infty} \frac{\ln x}{\sqrt{x}}$

b)$\lim_{x\to\infty}(\frac{2x-1}{2x+2})^{x+1}$

3 (20 pts.)

The volume of a cylinder of radius r and height h is $\pi r^2 h$. The diagonal L of the cylinder satisfies Pythagoras relation $L^2 = h^2 + (2r)^2$.

Question. Of all cylinders of given diagonal length L, determine the height and radius of the one that has maximum volume. Argue your answer thoroughly.

4 (30 pts.) Consider the function $f(x) = x^4 - 4x^3$.

a) Determine the intervals where f is increasing or decreasing.

b) Determine the intervals where (the graph of) f is concave up(CU) or concave down(CD).

c) Determine local maxima and minima.

d) Determine the points where the graph of f intersects the x-axis.

e) Use the information from above to sketch the graph of f(x) over the interval $[-1, 5]$.

[To receive full credit you must exhibit the features from a)-d)]

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