MA 113 - Calculus I	Spring 2002	Name: ______________________	Sec.: ____
FINAL EXAM	04/29/2002		

SEC.	INSTRUCTORS	T.A.'S	LECTURES	RECITATIONS
001	A. Corso	B. Bennewitz	MWF 8:00-8:50, CB 204	TR 8:00-9:15, CB 341
002	A. Corso	B. Bennewitz	MWF 8:00-8:50, CB 204	TR 9:30-10:45, CB 345
004	M. Silhavy	H. Song	MWF 10:00-10:50, CB 214	TR 8:00-9:15, CB 349
005	M. Silhavy	C. Budovsky	MWF 10:00-10:50, CB 214	TR 2:00-3:15, CB 343
006	M. Silhavy	H. Song	MWF 10:00-10:50, CB 214	TR 3:30-4:45, CB 345
007	A. Martin	M. Neu	MWF 12:00-12:50, CB 208	TR 9:30-10:45, CB 347
008	A. Martin	Y. Jia	MWF 12:00-12:50, CB 208	TR 11:00-12:15, CB 347
009	A. Martin	Y. Jia	MWF 12:00-12:50, CB 208	TR 12:30-1:45, CB 349
010	M. Silhavy	C. Budovsky	MWF 2:00-2:50, CB 204	TR 12:30-1:45, CB 345
011	M. Silhavy	M. Slone	MWF 2:00-2:50, CB 204	TR 2:00-3:15, CB 345
012	M. Silhavy	M. Slone	MWF 2:00-2:50, CB 204	TR 3:30-4:45, CB 349

Answer all of the following questions. Use the backs of the question papers for scratch paper. No books or notes may be used. You may use a calculator. You may not use a calculator which has symbolic manipulation capabilities. When answering these questions, please be sure to:

- check answers when possible,
- clearly indicate your answer and the reasoning used to arrive at that answer (*unsupported answers may receive NO credit*).

QUESTION	SCORE	TOTAL
1.		16
2.		16
3.		6
4.		10
5.		8
6.		16
7.		12
8.		8
9.		8
TOTAL		100

1. Compute the following limits. Each limit is worth 4 points.

(a) $\displaystyle \lim_{x\to 2} \frac{x^3-1}{x-1} =$ ______________

(b) $\displaystyle \lim_{x\to 0} \frac{\cos^2 x - 1}{2x^2} =$ ______________

(c) $\displaystyle \lim_{x\to \infty} \cot\left(\frac{2}{x} + \frac{\pi}{4}\right) =$ ______________

(d) $\displaystyle \lim_{x\to \infty} \frac{\sqrt{9x^4+8}}{3x^2+\sqrt{x}} =$ ______________.

pts: /16

2. Find the derivative of the following functions. Each derivative is worth 4 points. Do **not** simplify your answers.

(a) If $f(x) = (2x^8+7)(3x^2+5x)$ then $f'(x) =$ ______________________________

(b) If $f(x) = \sin(\sqrt[3]{x^2})$ then $f'(x) =$ ______________________________

(c) If $f(x) = \cos^3(x^3) + (5x^2-3)^3$ then $f'(x) =$ ______________________________

(d) If $f(x) = \dfrac{\sin(x^3-1)}{x^3+1}$ then $f'(x) =$ ______________________________

pts: /16

3. A particle is moving on a line such that its position after t hours is $s(t) = -t^2 + t + 2$ measured in miles.

(a) Find the velocity of the particle.

(b) When does the particle change its direction?

(c) What is the largest distance of the particle to its origin within the first 5 hours.

pts: /6

4. Consider the function $f(x) = \dfrac{x^3}{x^2 - 4}$.

(a) (3pts) Determine the intervals where $f(x)$ is increasing or decreasing. Find the values of f at the local minima and maxima of f.

(b) (3pts) Determine the intervals where $f(x)$ is concave up or down. Find the values of f at its inflection points.

(c) (2pts) Find the horizontal and vertical asymptotes of the graph of f.

(d) (2pts) Sketch the graph of f. **Make sure** to label the local extrema and the inflection points as well as to include the asymptotes of the graph of f.

pts: /10

5. Find the largest area of a rectangle that can be inscribed in a circle of radius 1.

pts: /8

6. Find the following indefinite integrals. Each problem is worth 4 points.

(a) $\displaystyle\int (\sqrt{x}+\sin(5x))\, dx =$ ________________________

(b) $\displaystyle\int \sqrt[3]{x}\cdot(x^7-1)\, dx =$ ________________________

(c) $\displaystyle\int \frac{\sin x}{\cos^5 x}\, dx =$ ________________________

(d) $\displaystyle\int (x^6+x^3)^7\cdot(3x^5+x^2) =$ ________________________

pts: /16

7. Calculate the following definite integrals. Each problem is worth 4 points.

(a) $\displaystyle\int_0^9 (x^2 - \sqrt{x})\, dx =$ ________________

(b) $\displaystyle\int_0^1 x^3\sqrt{1-2x^4}\, dx =$ ________________

(c) $\displaystyle\int_0^1 (2x+1)^2\, dx =$ ________________

pts: /12

8. (a) Sketch the region that is bounded by the graphs of the functions $f(x) = 2x - x^2$ and $g(x) = x^3$. Determine the points of intersections of the two curves.

(b) Compute the area of the region.

pts: /8

9. Find the volume of the solid that is obtained by rotating about the x-axis the region bounded by the curve $x - y^3 = 0$ and the line $x = 1$.

pts: /8