MA 113 - Calculus I — Spring 2002
SECOND MIDTERM — 03/05/2002

Name: ________________________ Sec.: ____

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. Budosvky	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.		9
2.		15
3.		20
4.		10
5.		8
6.		20
7.		10
8.		8
TOTAL		100

1. The population of a bacterial colony after t hours is given by

$$n(t) = 48t - t^3 + 100.$$

(a) (3 pts) Determine the growth rate as a function of time.

(b) (3 pts) Find the growth rate after 2 hours.

(c) (3 pts) Find the time t at which the population starts diminishing.

pts: /9

2. Compute the following limits. Each limit is worth 5 points.
Note: Remember to simplify your answers!

$(a)\ \lim_{x \to \pi/6} \frac{3\sin(-x)}{\cos^2(2x)} = $ ____________

$(b)\ \lim_{x \to 0} \frac{\cos^2(3x) - 1}{x^2} = $ ____________

$(c)\ \lim_{x \to 2} \frac{\sin(x-2)}{x^2 - x - 2} = $ ____________

pts: /15

3. Compute the derivatives of the following functions. Each derivative is worth 5 points. Do not simplify your answers.

(a) If $y = \pi^2 + x^2 \sin(8x)$ then $y' =$ ____________________

(b) If $y = \cos\sqrt{x}$ then $y' =$ ____________________

(c) If $y = \tan^2 x - \tan(x^2)$ then $y' =$ ____________________

(d) If $y = \dfrac{\cos x}{x-1}$ then $y' =$ ____________________

pts: /20

4. The volume of a ball is increasing at a rate of 10 cm^3/min.
How fast is the surface area increasing when the radius is 30 cm?

pts: /10

5. Each problem is worth 4 points

(a) Find the second derivative of $f(x) = \sqrt{1-x}$.

(b) If g is a twice differentiable function, find the second derivative of $f(x) = g(x^2+1)$ in terms of g, g', g''.

pts: /8

6. Calculate the derivatives of the following functions. Each derivative is worth 5 points. Do not simplify your answers.

(a) If $\quad F(x) = (x^3 - 5)^3 \quad$ then $\quad F'(x) =$ ____________________

(b) If $\quad F(x) = \sqrt{x - 4x^5} \quad$ then $\quad F'(x) =$ ____________________

(c) If $\quad F(x) = \sin(\cos(\sin x)) \quad$ then $\quad F'(x) =$ ____________________

(d) If $\quad F(x) = \sin\left(\dfrac{1-x}{1+x}\right) \quad$ then $\quad F'(x) =$ ____________________

pts: /20

7. Each problem is worth 5 points.

(a) Find the equation of the tangent line to the curve $y^3 - 2xy + x^3 = 0$ at the point $P(1,1)$.

(b) Express the derivative of y with respect to x in terms of x and y if $y^2 = \dfrac{x-1}{y-1}$.

pts: /10

8. Each part is worth 4 points.

(a) Find the linearization $L(x)$ of $f(x) = \sqrt[3]{x}$ at $a = 27$.

(b) Estimate the value of $\sqrt[3]{28}$.
Note: A calculator solution is not an acceptable answer.

pts: /8