MA 1401 FALL 2007 UNIFORM FINAL

Name: _____

Circle Your Section Number:

001	002	003
Olson/Graffeo	Russo/Vassilyev	Olson/Kuang
M/W 9:00-10:50	M/W 5:00-6:50	T/TH 1:00-2:50

Instructions:

- **Put your name on this page and the next. You should have 7 pages of this test.**
- **Circle your Section Number Above.**
- **Scratch paper will be provided. No notes or calculator will be allowed on this exam.**
- **If you are unclear what a problem is asking, then talk to your instructor for clarification. You may not ask for hints, verification of formulas, or if you have done the problem correctly. This exam is over what YOU know to date.**
- **Be neat. If the grader cannot understand what you have recorded, you will not get credit.**

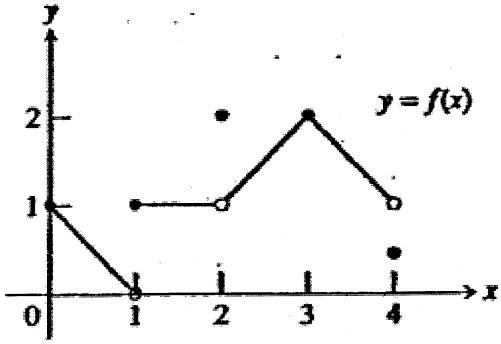
DO NOT WRITE BELOW THIS LINE

Page 1	Page 2	Page 3	Page 4	Page 5
28	20	21	15	23
Page 6	**Page 7**			
20	23			

Total: _____ **(Out of 150 Points)**

CALCULUS I: MA 1401 **NAME:**_____ **SCORE:** _____/150
FINAL EXAM FALL 2007

1. (2 points each). The complete graph of y=f(x) is given to the right. Which of the following statements are TRUE and which are FALSE?



a. $\lim_{x\to 0^+} f(x) = 1$ _____

b. $\lim_{x\to 1^-} f(x) = 1$ _____

c. $\lim_{x\to 1} f(x)$ does not exist. _____

d. $\lim_{x\to 2} f(x)$ does not exist. _____

e. $\lim_{x\to 4^-} f(x) \neq f(4)$ _____

f. f is not continuous at x=2 because f(2) does not exist. _____

g. f is continuous and differentiable at x=3. _____

h. The domain of f is [0, 4) _____

2. (4 points each). Evaluate the following limits. You may use any method, but show work where appropriate.

a. $\lim_{x\to 0} \dfrac{e^x - e^{-x}}{\sin x}$

b. $\lim_{x\to\infty} \dfrac{1-20x^2}{x^2+100x+2500}$

c. $\lim_{x\to 0^+} (x^2 \ln x)$

d. $\lim_{x\to 0^+}(1+2x)^{\frac{1}{(3x)}}$

3. (4 points each). Evaluate the derivatives of the following functions. **You do not have to simplify your answers.**

a. $y = \frac{3}{x^3} - \sin^3 x$

b. $y = \sqrt{x^5} \cdot \ln(5x)$

c. $y = \arctan(x^2 - 3x)$

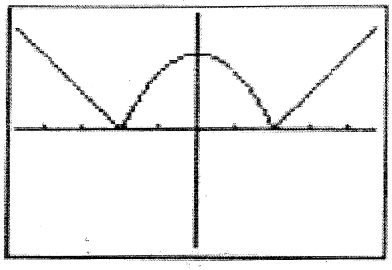
d. $y = \frac{\tan(x^2)}{3e^{4x}}$

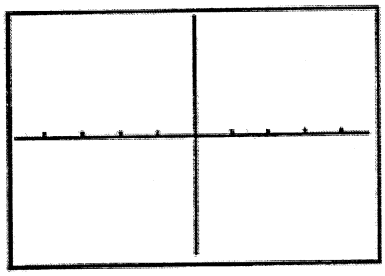
4. (5 points each). Evaluate the derivative y' of the following. In each case, solve for y'.

a. $3x^2 - x^2y^2 = y^3 - 4$

b. $y = (x+1)^x$, x>-1

5. (5 points) Given the graph of f shown below, sketch the graph of f'

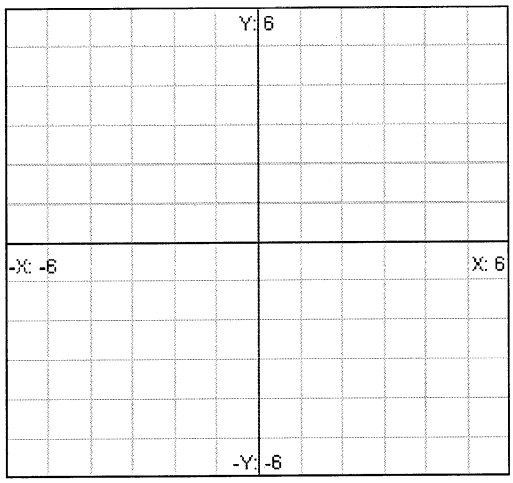




6. (6 points). A ladder 20 ft. long leans against a vertical building. If the bottom of the ladder slides away from the building at a rate of 2 ft/sec, how fast is the ladder sliding down the building when the top of the ladder is 16 ft. above ground?

7. (6 points). A rectangular page is to contain 24 square inches of print. The margins at the top and bottom of the page are each 1.5 inches wide. The margins on each side are 1 inch. What should the dimensions of the page be so that the least amount of paper is used?

8. (5 points). Draw a graph of a function $y = f(x)$ that has all of the following characteristics. (You may change the scale on the grid if needed).



a. f is continuous on $(-\infty, \infty)$.

b. $f(-2) = -1$, $f(-1.5) = 0$, $f(1) = 1$, $f(0) = 2$

c. F has a local maximum at x=0, and a local minimum at x=-2.

d. $f'(x) = -1$ on $(-\infty, -2)$, $f'(x) > 0$ on (-2, 0), and $f'(x) < 0$ on $(0, \infty)$.

e. $f''(x) > 0$ on $(1, \infty)$ and $f''(x) < 0$ on (-2, 1).

f. $\lim_{x \to \infty} f(x) = 0$

9. (4 points). Use the limit definition of the derivative to find $f'(x)$ given $f(x) = x^2 - x$. (You will receive 0 credit for using the Power Rule here.)

10. Given $f(x)=\dfrac{x^2-2x+4}{x-2}$, $f'(x)=\dfrac{x^2-4x}{(x-2)^2}$, and $f''(x)=\dfrac{8}{(x-2)^3}$

a. (3 points). Write equations of all asymptotes of f. _____

b. (4 points). Find intervals where f is increasing and decreasing.

Increasing: _____

Decreasing: _____

c. (4 points). Find intervals where the function is concave up and concave down.

Concave Up: _____

Concave Down: _____

d. (4 points). State x-values, if any, of all local maximum, local minimum, and inflection points. If there are none, write NONE.

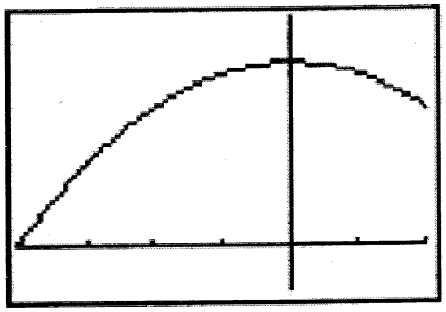
Local Maximum: _____ Local Minimum: _____ Inflection Points: _____

11. (4 points each). Given the parametric equations: $x=t+2\sin t$ and $y=t-2\cos t$ on $[0,2\pi]$.

a. Find the slope of the tangent line at $t=\dfrac{\pi}{2}$.

b. Find all points on the curve (ordered pairs) where the tangent line is horizontal.

12. (4 points each). To the right is the graph of $f(x) = -\frac{1}{2}x^2 + 8$.



a. Find the equation of the tangent line to f(x) at x=2. Write in y-intercept form.

b. Estimate the area under the graph of f from x= -4 to x=2 by using three approximating rectangles and right endpoints. Sketch the rectangles on the graph.

c. Set up the definite integral that would be used to calculate the area under f from x= -4 to x=2 exactly, and evaluate the integral using the Fundamental Theorem of Calculus Part I.

13. (4 points each). Evaluate the following indefinite integrals.

a. $\int x^2(\sqrt{x} + \sqrt[4]{x})dx$

b. $\int \frac{x}{x^2+4} dx$

14. (5 points). If $f'(x) = e^x + 4x + 9\sqrt{x}$ and f(1)=3, find the function f(x).

15. (5 points each). Evaluate the following definite integrals.

a. $\int_{\pi/2}^{\pi} (6 - 2\cos x)dx$

b. $\int_{1}^{2} xe^{x^2} dx$

c. $\int_{0}^{\sqrt{3}} \frac{x}{\sqrt{1+x^2}} dx$

16. (3 points). Find the derivative (with respect to x) of the function $F(x) = \int_{0}^{x} (e^{2t} \sin t)dt$