MA 1021 A '05 **Final Exam** **Name:** _____ .

Instructions

This test is closed book. Calculators are not allowed.

Part I - Basic Skills

Problem	1	2	3	4	5	6	7	Total
Value	5	5	5	5	5	5	5	35
Earned								

Part II

Problem	8	9	10	11	12	13	14	Total
Value								100
Earned								

Please Circle your Section

D. Tang (8:00)	B. Servatius (8:00)	D. Tang (9:00)	J.J. Malone (9:00)
J. Abraham (10:00)	B. Servatius (10:00)	C. Burgos (12:00)	H. Servatius (1:00)
U. Mosco (1:00)	M. Hill (2:00)	J. Goulet (PLC)	H. Servatius (3:00)

Part I - Basic Skills

Work the following problems and write your answers in the space provided. Use the scratch paper provided for your work. You need not simplify your answers.

1. Find $\dfrac{dy}{dx}$ if $y = x^7 - 5x^5 - \dfrac{1}{x^3} - 23$

ans. _____

2. Find $\lim\limits_{x \to 2^+} \dfrac{x+1}{x+3}$.

ans. _____

3. Find $f'(x)$ if $f(x) = \dfrac{3x^2+5}{x-1}$.

ans. _____

4. Find an equation for the tangent line to the curve $y = 2x^3 - x$ at the point $(1, 1)$.

ans. _____

5. Find $\dfrac{dy}{dx}$ if $y = \cos x + \tan x$

ans. _____

6. Find $D_x y$ if $y = (x^2 + 3x + 5)^7$.

ans. _____

7. Find $\dfrac{dy}{dx}$ if $y = e^x \ln x$.

ans. _____

Part II

Work all of the following problems. Show your work in the space provided. You need not simplify your answers, but remember that on this part of the exam your work and your explanations are graded, not just the final answers.

8. Evaluate each limit or show it does not exist.

   (a) $\lim_{x \to 2} \dfrac{x^2 - 4}{x^2 + x - 6}$

   (b) $\lim_{x \to 0} \dfrac{\sqrt{9 + x} - 3}{x}$

9. For $f(x) = x^2 + 4x - 3$ find $f'(x)$ by using the limit definition of derivative.

10. Find an equation for the tangent line to the curve $3x^2 - 4xy + 3y^2 = 12$ at the point (-2,0).

11. In this problem, you will analyze the curve given by

$$y = x^4 - 8x^3 + 10x^2.$$

(a) Find all intervals where $f(x)$ is increasing.

(b) Find all intervals where $f(x)$ is decreasing.

(c) Find all intervals where $f(x)$ is concave up.

(d) Find all invervals where $f(x)$ is concave down.

(e) Find all local maxima and minima of $f(x)$.

(f) Find any inflection points of $f(x)$.

12. A cylindrical can with a round base and open top is to hold $1000\pi^4 in^3$. Find the dimensions that require the least amount of material. (Note: The volume of a cylinder is $\pi r^2 h$, where r is the radius of its base and h is its height).

13. Use differentials or linear approximations to approximate $\sqrt[4]{80}$.

14. Find the derivative of the following functions

(a) $f(x) = \ln(\sin(x^2))$

(b) $f(x) = x^x$