Math 035 Final Examination, Spring 2005

Name:

Instructor:

Attention:

- 1) All cell phone must be switched off and kept in your bag, Or you can leave your phone at the teacher's desk if you are afraid of missing important calls.
- 2) Exact numbers, such as 1/3, $\sqrt{2}$ and $\sin 1$, rather than their approximations, such as 0.333, 1.414... etc., are preferred as answers.
- 3) Must show some detail rather than just show the final answer.
- 4) Calculators are not allowed.
 - (1) Find the following limits.

a) (3pts)
$$\lim_{x \to 1} \frac{x}{2+x}$$

b) (3pts)
$$\lim_{x\to 2} \frac{x^2 + 3x - 10}{x - 2}$$
.

c) (3pts)
$$\lim_{x \to \infty} \frac{\sqrt{x^2 + 3x - 10}}{x - 2}$$
.

Do not write in this space Page * 4 ph 1 (9)	.
2 (19)	_
3 (22)	
4 (10)	-
5 (10)	_
6 (10)	
7 (10)	-
8 (10)	_
Total (100)	

d) (3pts)
$$\lim_{x\to 1} \frac{x^2-1}{|x-1|}$$
.

e) (5pts)
$$\lim_{x\to 0} \sin(x)^{\frac{1}{\ln(x)}}$$
.

f) (3pts)
$$\lim_{t\to 1} \int_1^t f(x)dx$$

(2) Find
$$F'(x)$$
 where $F(x)$ is given below.

a) (4pts)
$$F(x) = x^2 + e^x + x^e + e^{\pi} + \ln x + \ln 2$$
.

b) (4pts)
$$F(x) = (x^2 + 2x - 7)^7 (\sin x)^8$$
.

c) (4pts)
$$F(x) = \tan^{-1}(x + \sqrt{x})$$
.

d) (4pts)
$$F(x) = \frac{x}{1 + \ln(x)}$$

e) (5pts)
$$F(x) = x^x$$
.

g) (4pts)
$$F(x) = \int_{1}^{x} \left(e^{t^{2} \sin t}\right) dt$$
.

(3) (5pts) State the definition of f'(x).

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(4) (10pts) The equation of a curve is

$$x^3 + y^3 = 6xy.$$

- a) Show that the point (3, 3) is on the curve.
- b) Find the equation of the tangent line to the curve at the point (3, 3).
- c) For what value(s) of x (if any) is the tangent line horizontal?

(5) (10pts) A 13-ft ladder is leaning against a wall. Its base is sliding away from the wall at 5 ft/second. How fast is the top of the ladder sliding down when the base is 12 ft away from the wall?

- (6) (10pts) The derivation of a function y = f(x) is given as $f'(x) = (x-1)^2(x-2)$. Find the following for the function y = f(x)
 - (a) critical points of f(x),
 - (b) intervals over which f is decreasing,
 - (c) intervals over which f is concave upward, and downward.
 - (d) x-coordinates of inflection points of f(x),
 - (e) x-coordinates of local maximum points of f(x)
 - (f) x-coordinates of the absolute maximum points of f(x) over the interval [-3,3].
 - (g) Roughly sketch the curve y = f(x) based on information obtained in (a-g).

(7) (10pts) Compute the following integrals:
a)
$$\int \frac{\sqrt{x} + x^4}{x} dx$$
.

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b)
$$\int_0^{\pi} (\sin x + \cos(2x)) dx.$$

c)
$$\int \frac{x^2}{\sqrt{1+x^3}} dx.$$

(8) (10pts) An open box with a square base is to be made of cardboard with a volume of $1ft^3$. Find the dimension of the box that uses the least amount of material.