Name: ______________________________

Instructor: __________________________

Math 10550, Exam I
September 16, 2008

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- No calculators.
- The exam lasts for 1 hour and 15 min.
- Be sure that your name is on every page in case pages become detached.
- Be sure that you have all 9 pages of the test.

PLEASE MARK YOUR ANSWERS WITH AN X, not a circle!

1.	(a)	(b)	(c)	(d)	(e)
2.	(a)	(b)	(c)	(d)	(e)
3.	(a)	(b)	(c)	(d)	(e)
4.	(a)	(b)	(c)	(d)	(e)
5.	(a)	(b)	(c)	(d)	(e)
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9.	(a)	(b)	(c)	(d)	(e)
10.	(a)	(b)	(c)	(d)	(e)

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Multiple Choice	________
11.	________
12.	________
13.	________
Total	________

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Multiple Choice

1.(7 pts.) If $f(2) = 5$, $f(3) = 2$, $f(4) = 5$, $g(2) = 6$, $g(3) = 2$ and $g(4) = 0$, find $(f \cdot g)(2) + f\big(g(3)\big)$.

(a) 30

(b) 35

(c) 25

(d) 20

(e) 15

2.(7 pts.) Evaluate the following limit

$$\lim_{x \to 0} \frac{2 - \sqrt{4 - x^2}}{x^2}.$$

(a) $-\dfrac{1}{2}$

(b) $\dfrac{1}{2}$

(c) $\dfrac{1}{4}$

(d) does not exist

(e) $-\dfrac{1}{4}$

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3.(7 pts.) For which value of the constant c is the function $f(x)$ continuous on $(-\infty, \infty)$?

$$f(x) = \begin{cases} c^2x - c & x \leq 1 \\ cx - x & x > 1. \end{cases}$$

(a) 1 (b) 0 (c) 2 (d) -2 (e) -1

4.(7 pts.) Compute

$$\lim_{x \to \pi/2+} \tan x.$$

(a) 0

(b) ∞

(c) 1

(d) $-\infty$

(e) Does not exist and is neither ∞ nor $-\infty$.

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5.(7 pts.) The function

$$f(x) = \frac{x^2 - 1}{x^3 - 4x}$$

is continuous everywhere except at

(a) $x = \pm 2$

(b) $x = 0$ and $x = \pm 1$

(c) f is a rational function and so it is continuous everywhere.

(d) $x = 0, x = \pm 1$ and $x = \pm 2$

(e) $x = 0$ and $x = \pm 2$

6.(7 pts.) If $f(x) = (x^2 + 3x)(6x^5 - 2x^8)$, compute $f'(1)$.

(a) 67 (b) 76 (c) 16 (d) 70 (e) -36

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7.(7 pts.) For $f(x) = \sqrt[3]{x^5} + \dfrac{6}{\sqrt[5]{x^3}}$, find $f'(x)$.

(a) $\dfrac{5\sqrt[3]{x^2}}{3} + \dfrac{5}{18\sqrt[5]{x^8}}$

(b) $\dfrac{3\sqrt[3]{x^2}}{5} - \dfrac{5}{18\sqrt[5]{x^8}}$

(c) $\dfrac{5\sqrt[3]{x^2}}{3} - \dfrac{18}{5\sqrt[5]{x^8}}$

(d) $\dfrac{3\sqrt[3]{x^2}}{5} + \dfrac{18}{5\sqrt[5]{x^8}}$

(e) $\dfrac{3\sqrt[3]{x^2}}{5} - \dfrac{18}{5\sqrt[5]{x^8}}$

8.(7 pts.) Find the equation of the tangent line to

$$y = \frac{7x - 3}{6x + 2}$$

at the point $(1, \frac{1}{2})$.

(a) $y = \frac{5}{4}x - \frac{3}{4}$

(b) $y = \frac{1}{2}x + \frac{1}{2}$

(c) $y = \frac{1}{2}x - \frac{1}{2}$

(d) $y = \frac{1}{2}x$

(e) $y = \frac{5}{4}x + \frac{3}{4}$

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9.(7 pts.) If $f(x) = x^2 \cos x$, find $f''(x)$.
(**Hint:** $(\sin x)' = \cos x$, $(\cos x)' = -\sin x$.)

(a) $f''(x) = 4\cos x + 4x\sin x - 2x^2\cos x$

(b) $f''(x) = 4\cos x - 4x\sin x + x^2\cos x$

(c) $f''(x) = 2\cos x - 4x\sin x - x^2\cos x$

(d) $f''(x) = 2\cos x + 2x\sin x - x^2\cos x$

(e) $f''(x) = 2\cos x - 4x\sin x + x^2\cos x$

10.(7 pts.) A ball is thrown straight upward from the ground with the initial velocity $v_0 = 96$ft/s. Find the highest point reached by the ball. Hint: The height of the ball at time t is given by $y(t) = -16t^2 + 96t$.

(a) 80ft (b) 120ft (c) 128ft

(d) 288ft (e) 144ft

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Partial Credit

You must show your work on the partial credit problems to receive credit!

11.(10 pts.) Find the equation of the tangent line to the curve $y = \dfrac{x^3}{3} - x^2 + 1$ which is parallel to the line $y + x = 4$.

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12.(10 pts.) Show that there are at least *two* roots of the equation

$$x^4 + 6x - 2 = 0.$$

Justify your answer and identify the theorem you use.

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13.(10 pts.) Given

$$y = \frac{1}{x^2 + 1},$$

find y' using the **definition** of the derivative.

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