Name: _____

Instructor: _____

Math 10550, Exam I
September 25, 2007

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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.

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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)

Please do NOT write in this box.

Multiple Choice _____

11. _____

12. _____

13. _____

Total _____

Name: _____

Instructor: _____

Multiple Choice

1.(7 pts.) Evaluate the following limit

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

(a) $\frac{1}{4}$

(b) does not exist

(c) $\frac{1}{2}$

(d) $-\frac{1}{2}$

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

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

Name: _____

Instructor: _____

3.(7 pts.) Given that f and g are differentiable at $x = 3$ and that $f(3) = 2$, $g(3) = -1$, $f'(3) = -4$ and $g'(3) = 3$, what is $\left(\frac{f}{g}\right)'(3)$?

(a) $-\frac{1}{2}$ (b) $\frac{1}{2}$ (c) $-\frac{2}{9}$ (d) 2 (e) -2

4.(7 pts.) For $f(x) = \sqrt[3]{x^5} + \frac{6}{\sqrt[5]{x^3}}$, find $f'(x)$.

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

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

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

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

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

Name: _____

Instructor: _____

5.(7 pts.) Find the equation of the tangent line to $y = \sqrt{x^2 - 1}$ at the point $(2, \sqrt{3})$.

(a) $y = \frac{1}{\sqrt{3}}x + \frac{2}{\sqrt{3}}$

(b) $y = \frac{2}{\sqrt{3}}x - \frac{4}{\sqrt{3}}$

(c) $y = \frac{2}{\sqrt{3}}x - \frac{1}{\sqrt{3}}$

(d) $y = \frac{2}{\sqrt{3}}x - \frac{2}{\sqrt{3}}$

(e) $y = \frac{1}{\sqrt{3}}x + \frac{1}{\sqrt{3}}$

6.(7 pts.) Compute

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

(a) 1 (b) 0 (c) ∞ (d) $-\infty$

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

Name: _____

Instructor: _____

7.(7 pts.) Find the derivative of

$$f(x) = x^2 \cos(\sqrt{x^3 - 1} + 2).$$

(a) $f'(x) = 4x \cos(\sqrt{x^3 - 1} + 2) - \dfrac{3x^4}{2\sqrt{x^3 - 1}} \sin(\sqrt{x^3 - 1} - 2)$

(b) $f'(x) = 2x \cos(\sqrt{x^3 - 1} + 2) - \dfrac{4x^4}{3\sqrt{x^3 - 1}} \sin(\sqrt{x^3 - 1} + 2)$

(c) $f'(x) = 2x \cos(\sqrt{x^3 - 1} + 2) - \dfrac{3x^4}{2\sqrt{x^3 - 1}} \sin(\sqrt{x^3 - 1} + 2)$

(d) $f'(x) = 2x \cos(\sqrt{x^3 - 1} + 2) - \dfrac{x^4}{2\sqrt{x^3 + 1}} \sin(\sqrt{x^3 - 1} + 2)$

(e) $f'(x) = x \cos(\sqrt{x^3 - 1} + 2) - \dfrac{x^4}{2\sqrt{x^3 - 1}} \sin(\sqrt{x^3 - 1} + 2)$

8.(7 pts.) If $f(x) = x^2 \cos x$, find $f''(x)$.

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

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

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

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

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

Name: _____

Instructor: _____

9.(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) 288ft (b) 144ft (c) 120ft

(d) 80ft (e) 128ft

10.(7 pts.) Find the limit

$$\lim_{x \to 0} \frac{1 - \cos x}{x \sin x}.$$

(a) 2 (b) 0 (c) $\frac{1}{2}$ (d) ∞ (e) 1

Name: _____

Instructor: _____

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 $y = \frac{x^3}{3} - x^2 + 1$ which is parallel to the line $y + x = 4$.

Name: _____

Instructor: _____

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.

Name: _____

Instructor: _____

13.(10 pts.) Given

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

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

Name: _____

Instructor: ANSWERS

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