Name: ____________________________

Instructor: _________________________

Math 10550, Exam II
October 18, 2007

- The Honor Code is in effect for this examination. All work is to be your own.
- 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)
6.	(a)	(b)	(c)	(d)	(e)
7.	(a)	(b)	(c)	(d)	(e)
8.	(a)	(b)	(c)	(d)	(e)
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	______

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Multiple Choice

1.(7 pts.) Find an equation for the tangent line to

$$x^2 + 2xy - y^2 + x = 2$$

at the point $(1, 2)$.

(a) $y = \frac{3}{2}x - 2$ (b) $y = \frac{5}{2}x - \frac{1}{2}$ (c) $y = \frac{7}{2}x - \frac{3}{2}$

(d) $y = \frac{7}{2}x - 6$ (e) $y = \frac{3}{2}x - \frac{1}{2}$

2.(7 pts.) The mass of a rod of length 10 cm is given by $m(x) = x^2 + \sqrt{x^2 + 9} - 3$ grams. What is the linear density of the rod at $x = 4$ cm?

(a) $\frac{204}{25}$ g/cm (b) 108 g/cm (c) $\frac{41}{5}$ g/cm (d) $\frac{44}{5}$ g/cm (e) $\frac{41}{25}$ g/cm

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3.(7 pts.) A man starts walking north from point P at a rate of 4 miles per hour. At the same time, a woman starts jogging west from point P at a rate of 6 miles per hour. After 15 minutes, at what rate is the distance between them changing?

(a) $\dfrac{8}{\sqrt{13}}$ miles per hour (b) $\dfrac{\sqrt{13}}{2}$ miles per hour (c) $\dfrac{12}{\sqrt{13}}$ miles per hour

(d) $2\sqrt{13}$ miles per hour (e) $\sqrt{13}$ miles per hour

4.(7 pts.) Use a linear approximation to estimate $\sqrt[3]{(8.06)^2}$.

(a) $\sqrt[3]{(8.06)^2} \approx 4.04$ (b) $\sqrt[3]{(8.06)^2} \approx 3.99$ (c) $\sqrt[3]{(8.06)^2} \approx 4.01$

(d) $\sqrt[3]{(8.06)^2} \approx 4.33$ (e) $\sqrt[3]{(8.06)^2} \approx 4.02$

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5.(7 pts.) Let

$$f(x) = x^4 - 24x^2 + 5x + 3.$$

Find the intervals where f is concave up.

(a) $(-\infty, \infty)$ (b) $(-2, 2)$ (c) $(-2, 2) \cup (2, \infty)$

(d) $(-\infty, -2) \cup (-2, 2)$ (e) $(-\infty, -2) \cup (2, \infty)$

6.(7 pts.) Evaluate the limit

$$\lim_{x\to\infty} \frac{2 - 3x^2}{5x^2 + 4x}$$

(a) $-\dfrac{3}{5}$ (b) $\dfrac{2}{5}$ (c) ∞ (d) $-\infty$ (e) 0

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7.(7 pts.) Suppose f is continuous on $[2, 5]$ and differentiable on $(2, 5)$. If $f(2) = 1$ and $f'(x) \leq 3$ for $2 < x < 5$. According to the Mean Value Theorem, how large can $f(5)$ possibly be?

(a) 12 (b) ∞ (c) 10 (d) 9 (e) 4

8.(7 pts.) Consider the function

$$f(x) = \frac{x}{x^2 + 9}.$$

One of the following statements is true. Which one?

(a) f has no horizontal asymptotes, and f has a global minimum at $x = -3$.

(b) The line $y = 0$ is a horizontal asymptote of f, and f has a global maximum at $x = 3$.

(c) The line $y = 0$ is a horizontal asymptote of f, and f has a global minimum at $x = 3$.

(d) f has no horizontal asymptotes, and f has a global maximum at $x = 3$.

(e) The line $y = 1$ is a horizontal asymptote of f, and f has a local maximum at $x = 0$.

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9.(7 pts.) Let

$$f(x) = \frac{x}{x+2}.$$

After verifying that f satisfies the hypothesis of the Mean Value Theorem on the interval $[0, 2]$, find all numbers c that satisfy the conclusion of the Mean Value Theorem.

(a) $c = \frac{1}{8}$ (b) $c = 2\sqrt{2} - 2$ (c) $c = \frac{1}{2}$

(d) $c = \pm 2\sqrt{2}$ (e) $c = \frac{1}{4}$

10.(7 pts.) Consider the function

$$f(x) = \frac{x}{x-1}.$$

One of the following statements is true. Which one?

(a) $y = 0$ is a horizontal asymptote of f, and f is always decreasing.

(b) $x = -1$ is a vertical asymptote of f, and f is concave down on the interval $(-1, 1)$.

(c) $y = 1$ is a horizontal asymptote of f, and f is concave down on the interval $(-\infty, 1)$.

(d) f has no horizontal asymptotes, and f has no global maximum or minimum.

(e) $x = 1$ is a vertical asymptote of f, and f is concave down on the interval $(1, \infty)$.

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Partial Credit

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

11.(10 pts.) The position of a particle moving horizontally is given by

$$s(t) = t^5 - \frac{20}{3}t^3 + 6, \qquad \text{for } t \geq 0.$$

(a) When is the particle moving to the right?

(b) What is the total distance travelled between $t = 0$ seconds and $t = 3$ seconds?

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12.(10 pts.) A melting ice cube is decreasing in volume at a rate of 10 cm^3/minute, but remains a cube as it melts.

(a) How fast are the edges of the cube decreasing when the length of each edge is 20 cm?

(b) How fast is the surface area of the cube decreasing when the length of each edge is 20 cm?

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13.(10 pts.) Let

$$f(x) = 3x^4 + 16x^3 - 30x^2 - 2.$$

(a) What are the critical numbers for f?

(b) If we restrict f to the interval $[-1, 1]$, give the x and y values for the global maximum and the global minimum for f on this interval.

Global Max at $(x, y) =$ ________________ Global Min at $(x, y) =$ ________________