Name: _____

Instructor-section: Bullwinkle

Math 125, Test II
October 29, 1998

- The Honor Code is in effect for this examination. All work is to be your own.
- No calculators.
- The exam lasts for one hour.
- Be sure that your name is on every page in case pages become detached.
- Be sure that you have all 11 pages of the test.

Good Luck!

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)

DO NOT WRITE IN THIS BOX!

Total multiple choice: _____

9. _____

10. _____

11. _____

12. _____

13. _____

14. _____

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Multiple Choice

1.(5pts) The Mean Value Theorem states that for a suitable function $y = f(x)$ on a closed interval $[a, b]$, there is a number c in the interval where $f'(c)$ equals the average rate of change of $f(x)$ on $[a, b]$. For the function $f(x) = \dfrac{1}{x}$ on the interval $[3, 12]$, what value of c satisfies the conclusion of the theorem?

(a) 5 (b) 6 (c) 7 (d) 8 (e) 9

2.(5pts) Which of the following functions is an antiderivative for

$$x \cos x \quad ?$$

(a) $x \sin x + \cos x$ (b) $\dfrac{x^2}{2} \cos x$ (c) $x \sin x$ (d) (e)

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3.(5pts) The equation $x^3 + x - 1 = 0$ has exactly one real solution. Starting with the estimate $x_0 = 1$, use one step of Newton's method to find a better approximation:
(a) $\frac{1}{2}$ (b) 0 (c) $\frac{3}{4}$ (d) $\frac{3}{2}$ (e) 2

4.(5pts) Which of the following is the linearization of the function $f(x) = 3x^2 - 2$ at $x = 2$?
(a) $y = 3x + 2$ (b) $y = -6x + 2$ (c) $y = x + 1$ (d) $y = 12x - 14$ (e) $y = 6x - 10$

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5.(5pts) What are the asymptotes (both vertical and horizontal) for the graph of

$$y = \frac{(2x-1)^2}{(x-2)(x+3)} \quad ?$$

(a) $y = 2$, $x = -2$, $x = 3$
(b) $y = 2$, $y = -3$, $x = 4$
(c) $y = 2x - 1$, $y = 2$, $y = 3$
(d) $x = -3$, and $x = 5$
(e) $y = 4$, $x = 2$, $x = -3$

6.(5pts) Let $f(x) = x^{20} - 2x^{10} + 5$. Which of the following statements is true regarding $x = 1$ (the point $(1, 4)$)?
(a) $x = 1$ is a point of inflection
(b) $x = 1$ is a local maximum
(c) $x = 1$ is a local minimum
(d) $x = 1$ is a critical point but neither a local maxima nor a local minima
(e) $x = 1$ is a not a critical point

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7.(5pts) A continuous function $y = f(x)$ has the following properties:

(a) $f'(x) > 0$ for $x > 5$

(b) $f'(x) < 0$ for $x < 5$

(c) $f(5) = 10$.

How many solutions are there to the equation $f(x) = 0$?

(a) 2 (b) 3 (c) 0 (d) 1 (e) infinitely many

8.(5pts) The limit $\lim_{x\to\infty} \dfrac{10x^3 + 6x + 4}{2x^3 + 3x + 2}$ is

(a) 5 (b) $\dfrac{3}{4}$ (c) 2 (d) $\dfrac{10}{3}$ (e) 0

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Partial Credit

9.(10pts) Find the absolute minimum and the absolute maximum of the function $f(x) = x^2 - 2x$ on the interval $[0, 3]$.

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10.(10pts) Consider the function $y = f(x) = -x^3 - 3x^2 + 2$.

(a) Find the intervals where the function is increasing and where the function is decreasing. Locate any local extrema.

(b) Find the intervals on which $f(x)$ is concave up and those on which it is concave down. Locate all inflection points.

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11.(10pts) A function $y = f(x)$ on $(0, \infty)$ satisfies the following conditions:

$f(1) = 2$, $f(3) = 1$,

$f'(x) > 0$ on $(0, 1)$, $f'(x) < 0$ on $(1, \infty)$,

$f''(x) < 0$ on $(0, 3)$, $f''(x) > 0$ on $(3, \infty)$

$\lim_{x\to\infty} f(x) = 0$, $\lim_{x\to 0^+} f(x) = -\infty$.

Sketch the graph.

4in by 5in (coor scaled 500)

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12.(10pts) A right triangle with base 10 and adjacent angle θ has area $A = 50\tan\theta$. Find the differential dA and use this to estimate the change in A as θ increases from $\frac{\pi}{4}$ to $\frac{\pi}{4} + 0.01$.

1in by 1in (triangle scaled 200)

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13.(10pts) Each point P on the graph of $y = \dfrac{1}{4+x^2}$, $x > 0$, determines a rectangle in the first quadrant as shown in the diagram:

1in by 1in (graph scaled 300)

Find the dimensions of the rectangle with the largest area.

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14.(10pts) Find the equation of the function $y = f(x)$ that satisfies the initial value problem $y'(x) = -\sin x + 12x$, $y(0) = 3$.

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