Name: _____

Instructor-section: Bullwinkle

Math 125, Test III

December 1, 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. _____

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Multiple Choice

1.(5 pts.) Suppose that $\int_0^{-3} f(x)dx = 4$ and $\int_{-3}^{0} g(x)dx = 2$. Find $\int_{-3}^{0} (3f(x) + 4g(x))\,dx$.

(a) 4 (b) -4 (c) 18 (d) -17 (e) cannot be determined

2.(5 pts.) Partition the interval from 0 to 1 into n equal parts. In the k-th subinterval, choose the right-hand endpoint. The resulting Riemann sum for the integral $\int_0^1 3x^2 dx$ is

(a) $\frac{1}{n}\sum_{k=1}^{n}\left(3k^2\right)$

(b) $\frac{1}{n}\sum_{k=1}^{n}\left(3k^2n^2\right)$

(c) $\sum_{k=1}^{n}\left(\frac{k}{n}\left(3k^2n^2\right)\right)$

(d) $\frac{1}{n}\sum_{k=1}^{n}\left(\frac{3}{n^2}\right)$

(e) $\frac{1}{n}\sum_{k=1}^{n}\left(\frac{3k^2}{n^2}\right)$

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3.(5 pts.) Suppose that f is a continuous function on $[a, b]$ such that $\int_a^b f(x)dx = 0$. Which of the following must be true?

(a) There exists exactly one c in $[a, b]$ such that $f(c) = 0$.

(b) $f(c) = 0$ for all c in $[a, b]$

(c) There exists at least one c in $[a, b]$ such that $f(c) = 0$

(d) $f(x) \leq 0$ for all x in $[a, b]$

(e) $f'(c) = 0$ for some c in $[a, b]$

4.(5 pts.) Find $\int \frac{\sin x}{(1+\cos x)^3} dx$.

(a) $\frac{1}{2(1+\cos x)^2} + C$

(b) $\frac{1+C}{2(1+\cos x)^2}$

(c) $\frac{1}{2(1+\sin x)^2} + C$

(d) $\frac{1+C}{2(1+\sin x)^2}$

(e) $\frac{1}{(\sin x + \cos x)^2} + C$

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5.(5 pts.) Find the derivative $\frac{dy}{dx}$ of the function $y = \int_0^{x^2} \sqrt{1+t^2}dt$.

(a) $\sqrt{1+x^2}$ (b) $\sqrt{1+x^4}$ (c) $2x\sqrt{1+x^4}$ (d) $x^2\sqrt{1+x^2}$ (e) $x^2\sqrt{1+x^4}$

6.(5 pts.) Solve the initial value problem

$$\frac{dy}{dx} = \frac{1}{x}, \quad y(1) = 2.$$

(a) $-\frac{1}{x^2} + 3$ (b) $\frac{1}{x^2} + 1$ (c) $-\int_1^x \frac{1}{t}dt + 2$

(d) $\int_1^x \frac{1}{t}dt + 2$ (e) $\int_1^x \frac{1}{t}dt$

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7.(5 pts.) Find the area of the region between the curves $y = 1 + \cos x$ and the x-axis, $0 \leq x \leq \pi$.

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

8.(5 pts.) If $\int_0^x f(t)dt = x \sin x$, find $f(x)$.

(a) $x \sin x$ (b) $x \cos x$ (c) $\sin x + x \cos x$

(d) $\cos x - x \sin x$ (e) $(\sin x)(\cos x)$

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Partial Credit

9.(10 pts.) A solid lying above the xy-plane is being sliced by planes perpendicular to the y-axis. The base of the solid is the circle of radius 3 in the xy-plane given by $x^2 + y^2 = 9$. Each slice is a rectangle with one side a chord of this circle and the other side a constant height 5. Set up a definite integral which will yield the volume. Do NOT evaluate this integral.

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10.(10 pts.) Let $f(x) = 3\sqrt{x}$. Find the average value of f on $[1, 4]$.

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11.(10 pts.) Find the area of the region enclosed by the parabola $y = x^2 + x - 1$ and the line $y = x$.

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12.(10 pts.) Integrate

$$\int_0^1 \frac{x^2}{\sqrt{x^3+1}} dx.$$

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13.(10 pts.) Solve the initial value problem

$$\frac{dy}{dx} = 6x^2(x^3 - 1)^3, \quad y(1) = 3.$$

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14.(10 pts.) Estimate the integral

$$\int_0^2 \frac{1}{1+x^2}\,dx$$

(a) using the trapezoidal rule with $n = 4$
(b) using the Simpson's rule with $n = 4$

We are looking for the formulas for these two rules. In particular **DO NOT** attempt to add the fractions and no error estimates are required.

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