

Name: \_\_\_\_\_

Instructor: \_\_\_\_\_

**Math 10550, Exam III**  
**November 28, 2006**

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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)
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Multiple Choice	_____
11.	_____
12.	_____
13.	_____
Total	_____

Name: \_\_\_\_\_

Instructor: \_\_\_\_\_

Multiple Choice

1.(7 pts.) Compute

$$\int_1^2 t\sqrt{t-1} dt$$

(a)  $\frac{4}{3}$

(b) 2

(c)  $\frac{16}{15}$

(d)  $\frac{2t}{3}$

(e)  $\frac{11 \cdot 2^{\frac{5}{2}} - 16}{15}$

2.(7 pts.) Find the value of the following integral.

$$\int_{-1}^1 \sqrt{1+x^2} \sin x dx$$

(a)  $2\sqrt{2} \sin 1$

(b) 2

(c)  $\frac{1}{3}2^{\frac{5}{2}} \cos 1$

(d) 0

(e)  $-\frac{1}{3}2^{\frac{5}{2}} \cos 1$

Name: \_\_\_\_\_

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3.(7 pts.) Evaluate the following limit.

$$\lim_{n \rightarrow \infty} \sum_{i=1}^n \sin\left(\frac{\pi i}{n}\right) \cdot \frac{1}{n}$$

(Hint: Identify this as a limit of a Riemann sum and compute the corresponding integral.)

(a)  $\frac{2}{\pi}$

(b)  $\pi(1 - \cos 1)$

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

(d)  $2\pi$

(e)  $2$

4.(7 pts.) A table of values for a function  $f$  is given below.

$t$	0	2	4	6
$f(t)$	1	2	4	5

Use 3 rectangles and left endpoints to estimate the value of the integral

$$\int_0^6 f(t) dt.$$

(a) 22

(b) 14

(c) 7

(d) 24

(e) 11

Name: \_\_\_\_\_

Instructor: \_\_\_\_\_

5.(7 pts.) Compute

$$\int_{-4}^0 \sqrt{16 - x^2} dx.$$

- (a)  $\pi$             (b)  $8\pi$             (c)  $64\pi$             (d)  $16\pi$             (e)  $4\pi$

6.(7 pts.) Compute

$$\int \frac{1 + t^2}{t^2} dt.$$

- (a)  $\frac{t^2 + 3}{t^2} + C$             (b)  $\frac{t^2 - 1}{t} + C$             (c)  $-\frac{2}{t^3}$   
(d)  $-\frac{1}{x} + x + C$             (e)  $-\frac{1}{t} + t$

Name: \_\_\_\_\_

Instructor: \_\_\_\_\_

7.(7 pts.) Find an expression for the area bounded by the curves  $y = 4 - x^2$  and  $y = 2 - x$ .

(a)  $\int_{-1}^2 (6 - x - x^2) dx$

(b)  $\int_{-2}^2 (4 - x^2) dx$

(c)  $\int_{-2}^{-1} (4 - x^2) dx + \int_{-1}^2 (2 - x) dx$

(d)  $\int_{-1}^2 (x^2 - x - 2) dx$

(e)  $\int_{-1}^2 (2 + x - x^2) dx$

8.(7 pts.) Solving the equation  $x^3 + x^2 - 1 = 0$  using Newton's method with initial guess  $x_1 = 1$ , what is  $x_2$ ?

(a)  $\frac{6}{5}$

(b)  $\frac{5}{6}$

(c)  $-4$

(d)  $\frac{4}{5}$

(e)  $1$

Name: \_\_\_\_\_

Instructor: \_\_\_\_\_

9.(7 pts.) Let

$$f(x) = \int_{x^2}^2 \frac{1}{1+t^2} dt.$$

Find  $f'(x)$ .

(a)  $\frac{1}{5} - \frac{1}{1+x^4}$

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

(c)  $-\frac{2x}{1+x^4}$

(d)  $-\frac{1}{1+x^4}$

(e)  $\frac{2x}{1+x^4}$

10.(7 pts.) Find an expression for the volume obtained by rotating the region bounded by the curves  $y = \sqrt{x}$ ,  $y = x - 2$  and  $y = 0$  about the  $x$ -axis.

(a)  $\pi \int_0^2 \sqrt{x} dx + \pi \int_2^4 [\sqrt{x} - (x - 2)] dx$

(b)  $\int_0^2 \sqrt{x} dx + \int_2^4 [\sqrt{x} - (x - 2)] dx$

(c)  $\pi \int_0^2 x dx + \pi \int_2^4 [x - (x - 2)^2] dx$

(d)  $\int_0^4 [x - (x - 2)^2] dx$

(e)  $\pi \int_0^2 [(y + 2)^2 - y^4] dy$

Name: \_\_\_\_\_

Instructor: \_\_\_\_\_

Partial Credit

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

11.(10 pts.) The velocity of a particle (in meters per second) is given by

$$v(t) = 12 + 6t - 6t^2.$$

(a) What is the **displacement** of the particle over the interval  $[0, 3]$ ?

(b) What is the **distance** traveled by the particle over the interval  $[0, 3]$ ?

Name: \_\_\_\_\_

Instructor: \_\_\_\_\_

**12.**(10 pts.) A graphic artist is designing a rectangular poster, which is to have margins of 2 inches at the top and along each side, and a 3-inch margin at the bottom. In order to save expenses, she wants the total area of the poster to be as small as possible, but the printed area (the part inside the margins) has to be 180 square inches. What dimensions of the poster will minimize the total area?

Name: \_\_\_\_\_

Instructor: \_\_\_\_\_

**13.**(10 pts.) Compute the volume obtained by rotating the region bounded by the curves  $x = y^2$  and  $y = x$  about  $x = 1$ .

Name: \_\_\_\_\_

Instructor: ANSWERS

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