Name: _____

Instructor: _____

Math 10550, Exam III
November 27, 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)
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9.	(a)	(b)	(c)	(d)	(e)
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Multiple Choice _____

11. _____

12. _____

13. _____

Total _____

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Multiple Choice

1.(7 pts.) Solving the equation $x^2 - 2 + \cos(\frac{\pi x}{2}) = 0$ using Newton's method with initial approximation $x_1 = 1$, what is x_2?

(a) $x_2 = \frac{1}{2}$ (b) $x_2 = 1$ (c) $x_2 = \pi$

(d) $x_2 = \frac{\pi}{2} - 1$ (e) $x_2 = \frac{6 - \pi}{4 - \pi}$

2.(7 pts.) The area of an ellipse

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

of semi-axis a and b is known to be πab. Use this (or some other geometric fact) to evaluate the integral

$$\int_{-a}^{a} \frac{b}{a}\sqrt{a^2 - x^2}dx$$

(a) $\pi a^2 b^2$ (b) πab^2 (c) $\sqrt{\pi}ab$ (d) $2\pi a^2 b$ (e) $\frac{1}{2}\pi ab$

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3.(7 pts.) Calculate the indefinite integral

$$\int \frac{3x + 3\sqrt{x}}{\sqrt{x}} dx =$$

(a) $3x^2 + C$ (b) $3x^{3/2} + C$ (c) $3x + 2x^{3/2} + C$

(d) $x + \sqrt{x} + C$ (e) $x^{3/2} + C$

4.(7 pts.) Calculate the definite integral

$$\int_0^{\pi} |\cos x| dx =$$

(a) $\frac{\pi}{2}$ (b) π (c) 1

(d) 2 (e) 2π

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5.(7 pts.) Calculate

$$\int 6\tan^5 x \sec^2 x dx =$$

(a) $\tan x \sec x + C$ (b) $\sec^6 x + C$ (c) $\tan^5 x + C$

(d) $\tan^6 x + C$ (e) $\sec^4 x + C$

6.(7 pts.) Which of the following estimate holds for the integral

$$I = \int_0^1 (1 + \cos^2 x) dx?$$

(a) $0 \leq I < \frac{\pi}{6}$ (b) $1 \leq I \leq 2$ (c) $2 < I \leq 3$

(d) $I \leq 1 + \cos^2 1$ (e) $0 < I < 1$

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7.(7 pts.) Find the volume of the solid obtained by rotating the region bounded by $y = x^6$, $y = 1$, and $x = 0$, about the y - axis.

(a) 3π (b) $\frac{4\pi}{3}$ (c) $\frac{3\pi}{4}$ (d) 4π (e) $\frac{\pi}{4}$

8.(7 pts.) Consider the function

$$g(x) = -\int_{\sin x}^{0} \sqrt{t^3 + 1}dt.$$

Then $g'(x) =$

(a) $\sqrt{\sin^3 x + 1}\ \cos x$ (b) $(\sin^3 x + 1)\ \cos x$ (c) $3(\sin^2 x)\ \sqrt{\sin^3 x + 1}$

(d) $\sin^3 x\ \cos x$ (e) $\sqrt{\sin^3 x + 1}$

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9.(7 pts.) Calculate the integral

$$\int_{-2}^{2} \frac{x^3}{1+\cos^2 x} dx.$$

(a) $\frac{1}{16}$ (b) $\frac{1}{8}$ (c) 0

(d) 16 (e) 8

10.(7 pts.) Which of the following is a Riemann sum corresponding to the integral

$$\int_{1}^{2} \sin x \, dx?$$

(a) $\frac{2}{n}\sum_{i=1}^{n} \sin(1+\frac{i}{n})$ (b) $\frac{1}{n}\sum_{i=1}^{n} \sin(1+\frac{i}{n})$ (c) $\frac{1}{n}\sum_{i=1}^{n} \sin(\frac{2i}{n})$

(d) $\frac{1}{n}\sum_{i=1}^{n} \sin(1+\frac{2i}{n})$ (e) $\frac{2}{n}\sum_{i=1}^{n} \sin(\frac{2i}{n})$

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Partial Credit

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

11.(10 pts.) Find the area of the region bounded by the curves $y = \sin x$, $y = \cos x$ and the vertical lines $x = 0$, $x = \dfrac{\pi}{2}$.

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12.(10 pts.) Find the coordinates of the point on the line $x + y + 1 = 0$ that is closest to the origin. Hint: the computations are a bit easier if you minimize the *square* of the distance to the origin.

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13.(10 pts.) A cylindrical can without a top is made to contain π cubic centimeters of liquid. Find the dimensions (height and radius of the cylinder) that will minimize the cost of the metal to make the can.

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