MATH 1210-6
Spring 2003
Midterm exam III

Student Name: _____

Student ID Number: _____

Course Abbreviation and Number:	*Math 1210*
Course Title:	*Calculus I*
Instructor:	*Vladimir Vinogradov*

Date of Exam:	*April 7, 2003*
Time Period:	Start time: *12:55 pm* End Time: *1:55 pm*
Duration of Exam:	*1 hours*
Number of Exam Pages: (including this cover sheet)	*6*
Exam Type:	*Closed Book*
Additional Materials Allowed:	*Calculator*

QUESTION	VALUE	SCORE
1	20	
2	20	
3	20	
4	20	
5	20	
TOTAL	100	

*) The bonus question counts for 10 points maximum.

1. (20 points) Find the indefinite integral of:

$$\int 24x(x^2-1)^3 dx$$

ANSWER: _____

2. (20 points) Find the function whose value at 1 is 0 and whose derivative is given:

$$\frac{dy}{dx} = \frac{3(x^2+1)}{(x^3+3x)^2}$$

ANSWER: _____

3. (20 points) Calculate the definite integrals:

$$\int_{\pi/6}^{\pi/3} 4\Big(\sin(4x) - \cos(4x)\Big)\, dx$$

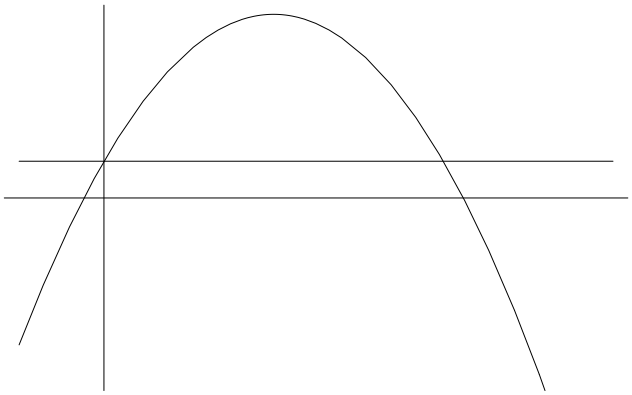
ANSWER: _____

4. (20 points) Find the solution to the following differential equation such that $y(0) = 1$

$$\frac{dy}{dx} = \sqrt{x}y^2 + 2x^2y^2$$

ANSWER: _____

5. (20 points) What is the area of the region bounded by the curves $y_1 = 5 - (x-2)^2$ and $y_2 = 1$.



ANSWER: _____

Bonus question (10 points). Evaluate

$$\frac{d}{dx}\int_{-x^2}^{x^2} f(t)dt$$

ANSWER: _____

Useful formulae

Differentiation

Product rule: $(f(x)g(x))' = f'(x)g(x) + f(x)g'(x)$

Quotient rule: $\left(\frac{f(x)}{g(x)}\right)' = \frac{f'(x)g(x) - f(x)g'(x)}{g^2(x)}$

Chain rule: $\frac{d}{dx}f(g(x)) = \frac{df}{dg} \cdot \frac{dg}{dx}$

Power rule $(x^\alpha)' = \alpha x^{\alpha-1}$

Trigonometric functions: $(\cos x)' = -\sin x$, $(\sin x)' = \cos x$

Integration

$$\int f(g(x))g'(x)dx = \int f(u)du = F(g(x)) + C$$

$$\int_a^b f(g(x))g'(x)dx = \int_{g(a)}^{g(b)} f(u)du = F(g(b)) - F(g(a))$$

$$\cos(0) = 1,\ \sin(0) = 0$$

$$\cos(\frac{\pi}{6}) = \frac{\sqrt{3}}{2},\ \sin(\frac{\pi}{6}) = \frac{1}{2}$$

$$\cos(\frac{\pi}{4}) = \frac{\sqrt{2}}{2},\ \sin(\frac{\pi}{4}) = \frac{\sqrt{2}}{2}$$

$$\cos(\frac{\pi}{3}) = \frac{1}{2},\ \sin(\frac{\pi}{3}) = \frac{\sqrt{3}}{2}$$

$$\cos(\frac{\pi}{2}) = 0,\ \sin(\frac{\pi}{2}) = 1$$

$$\cos(\pi) = -1,\ \sin(\pi) = 0$$