Name and Section: _____

Instructor's Name: _____

Math 2 Midterm 2

February 19, 2007

Instructions: This is a closed book, closed notes exam. You are not allowed to provide or receive help from any outside source during the exam.

- *Print* your name, section number and instructor in the space provided.
- No calculators are allowed.
- You must show your work to receive full credit.

Honor Statement:

I have neither given nor received help on this exam, and all of the answers are my own.

_____

Signature

Question	Points	Score
1	24	
2	24	
3	10	
4	10	
5	12	
6	8	
7	8	
8	8	
9	10	
10	16	
11	12	
12	8	
13	0	
Total:	150	

1. Compute the following integrals using the substitution method:

(a) [8 points]

$$F(x) = \int 2x \sin(x^2)\ dx$$

(b) [8 points]

$$F(x) = \int \frac{5x^3}{3 + x^4}\ dx$$

(c) [8 points]

$$\int_1^e \frac{1}{x} \ln^2(x)\ dx$$

2. Compute the following integrals using the integration by parts method:

(a) [8 points]

$$F(x) = \int xe^x \, dx$$

(b) [8 points]

$$\int_1^2 x \ln(x) \, dx$$

(c) [8 points]

$$F(x) = \int \sin(x)e^x \, dx$$

3. [10 points] Compute the following indefinite integral:

$$F(x) = \int 2x^3 \cos(x^2)\ dx$$

[Hint: Use substitution first and then parts]

4. [10 points] Compute the following indefinite integral:

$$F(x) = \int \arcsin(x)\ dx$$

[Hint: Remember that $\frac{d}{dx} \arcsin(x) = \frac{1}{\sqrt{1-x^2}}$]

5. [12 points] Compute the following indefinite integral:

$$F(x) = \int \frac{x^2+1}{x} \ln(x)\ dx$$

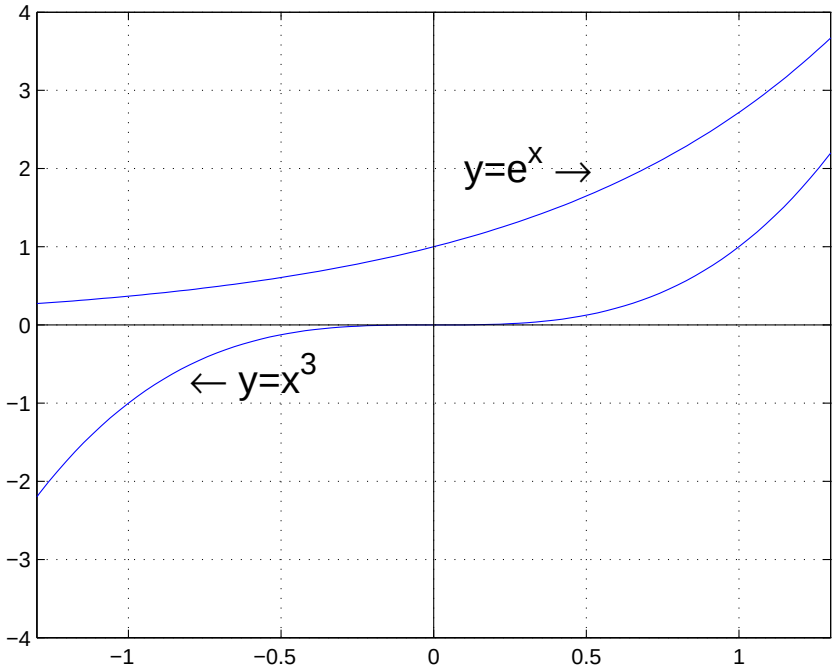
6. [8 points] Evaluate

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

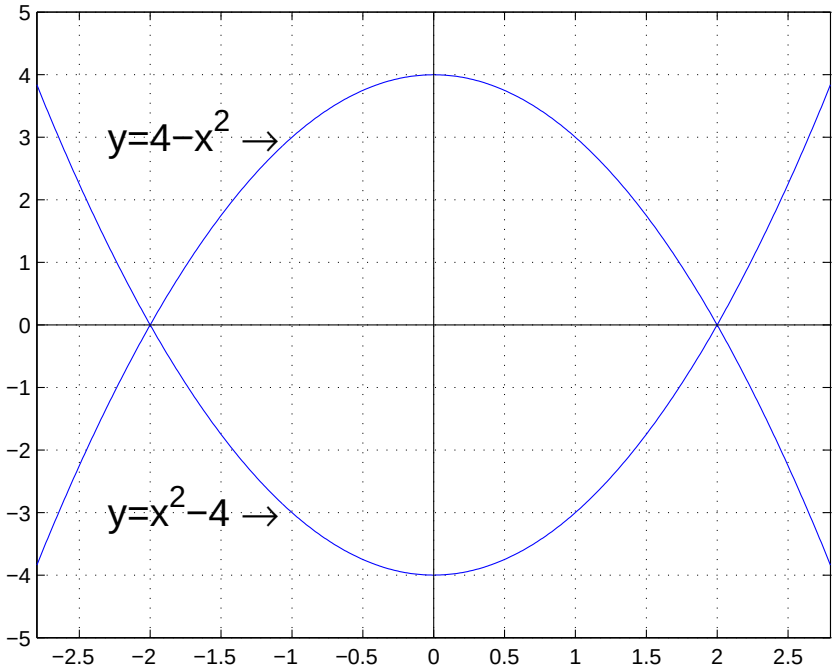
by interpreting the integral in terms of area.

[Hint: $x^2 + y^2 = 4$ is the equation of a circle of radius 2]

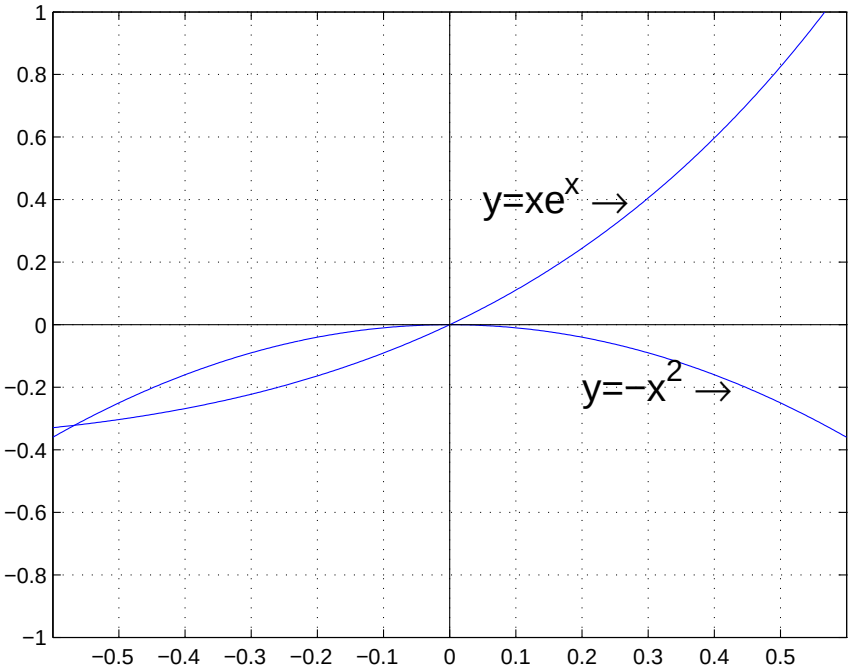
7. [8 points] Shade on the graph and compute the area in between the curves $y = e^x$ and $y = x^3$ in between the lines $x = -1$ and $x = 1$.



8. [8 points] Shade on the graph and compute the area in between the curves $y = x^2 - 4$ and $y = 4 - x^2$.



9. [10 points] Shade on the graph and compute the area in between the curves $y = xe^x$ and $y = -x^2$ in between the lines $x = -\frac{3}{10}$ and $x = \frac{3}{10}$.



10. Determine if each of the following statements is true or false. If it is true, explain why, if not, find a counterexample, that is, a case that proves the statement is incorrect.

(a) [8 points] If f is a continuous function then

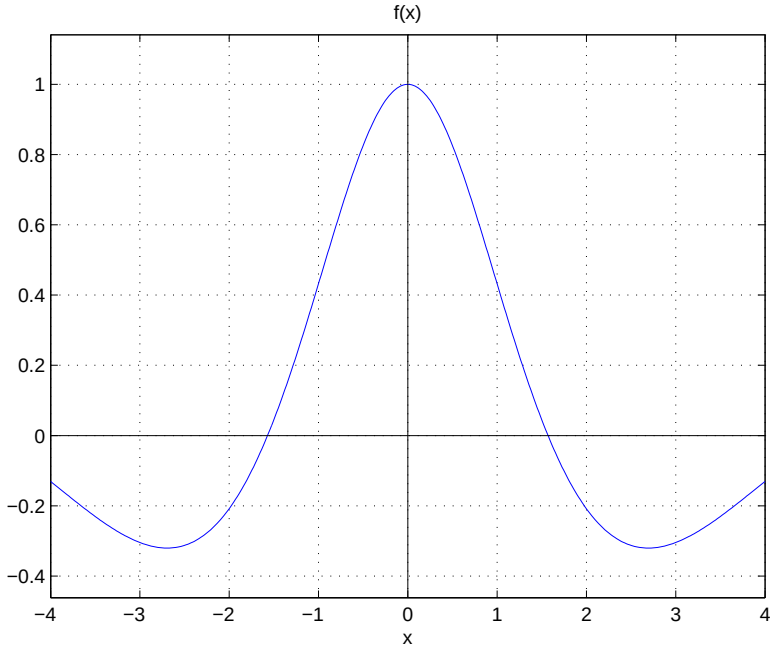
$$\int f^2(x)\ dx = \frac{f^3(x)}{3f'(x)} + C$$

where C is a constant number.

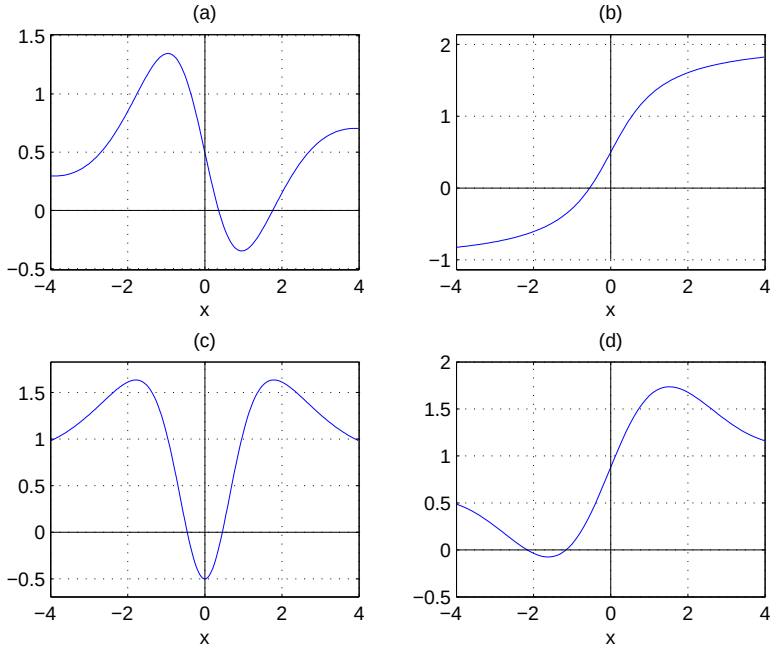
(b) [8 points] If f and g are continuous functions, then

$$\int f(x) \cdot g(x)\ dx = \left(\int f(x)\ dx\right) \cdot \left(\int g(x)\ dx\right)$$

11. [12 points] Given the function $f(x)$ whose graph is drawn below



circle the graph corresponding to one of the antiderivatives of $f(x)$ and explain the reason for your choice.



12. [8 points] Find an expression for the function:

$$F(x) = \frac{d}{dx} \int_1^{x^2} \frac{e^t}{2t}\, dt$$

Extra credit question

13. Find an expression for the function:

$$F(x) = \frac{d}{dx} \int_{-1}^{x} \left(\int_0^{t^2} e^u\, du \right) dt$$

[**Hint:** If you have time left, check that all of your integrals are correct.]