

NAME: \_\_\_\_\_

# MATH 112 EXAM 2

October 15, 2010

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

- Print your name clearly in the space provided.
- You may use a calculator.

## 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	72	
2	10	
3	10	
4	8	
Total:	100	

You may use the following formulas (if applicable):

$$\int \sec x dx = \ln |\sec x + \tan x| + C$$

$$\frac{d}{dx}(\sec x) = \sec x \tan x$$

$$\int \sin^n x dx = \frac{-\sin^{n-1} x \cos x}{n} + \frac{n-1}{n} \int \sin^{n-2} x dx$$

$$\int \cos^n x dx = \frac{\cos^{n-1} x \sin x}{n} + \frac{n-1}{n} \int \cos^{n-2} x dx$$

$$\int \sin^2 x dx = \frac{x}{2} - \frac{\sin 2x}{4} + C = \frac{x}{2} - \frac{1}{2} \sin x \cos x + C$$

$$\int \cos^2 x dx = \frac{x}{2} + \frac{\sin 2x}{4} + C = \frac{x}{2} + \frac{1}{2} \sin x \cos x + C$$

$$\int \frac{dx}{x^2 + 1} = \tan^{-1} x + C$$

1. [72 points] Choose any 4 of the following integrals to solve. 18 points each. You may choose up to 2 of any of the remaining 5 to solve for extra credit for 4 points each. (no partial credit on the extra credit problems-all or nothing) **Please clearly mark which problems you wish to turn in for the 4 test problems and which you would like to turn in for extra credit.**

(a)  $\int \frac{3dx}{(x+1)(x^2+x)}$

(b)  $\int_0^4 x\sqrt{4-x}dx$

(c)  $\int \frac{dx}{(x^2+1)^3}$

(d)  $\int \frac{3x^3 \tan x + 2x^2}{x^2 \sec x} dx$

(e)  $\int \cos x \sin^5 x dx$

(f)  $\int \frac{dx}{\sqrt{x^2+x}}$

(g)  $\int \frac{x^2}{(x+1)(x^2+1)} dx$

(h)  $\int \frac{x^2+x+3}{(x-1)^3} dx$

(i)  $\int x^2 \sin(3x+1) dx$

2. [10 points] Prove or provide a counter-example. If  $f$  and  $g$  are two integrable functions, then

$$\int f(x) \cdot g(x) dx = \int f(x) dx \cdot \int g(x) dx.$$

3. [10 points] Suppose that  $\int f(x)dx = \ln x + \sqrt{x+1} + C$ . Can  $f(x)$  be a rational function? Explain.

4. [8 points] Which integral requires more work to evaluate? (You do not need to evaluate either one.)

$$\int \sin^{798}(x) \cos(x) dx \text{ or } \int \sin^6(x) \cos^6(x) dx.$$

Explain.