

MA 2560: Calculus II (Spring 2011)

Exam 1

NAME:

Instructions: Answer each of the following questions completely. To receive full credit, you must show sufficient work for each of your answers (unless stated otherwise). How you reached your answer is more important than the answer itself. If something is unclear, or if you have any questions, then please ask. Good luck!

Here are some potentially useful formulas. You should *not* expect to use all of them.

$$\frac{d}{dx}[\sinh x] = \cosh x$$

$$\frac{d}{dx}[\cosh x] = \sinh x$$

$$\frac{d}{dx}[\tanh x] = \operatorname{sech}^2 x$$

$$\frac{d}{dx}[\operatorname{sech} x] = -\operatorname{sech} x \tanh x$$

$$\frac{d}{dx}[\arcsin x] = \frac{1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx}[\arccos x] = \frac{-1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx}[\arctan x] = \frac{1}{1+x^2}$$

$$\frac{d}{dx}[\operatorname{arcsec} x] = \frac{1}{x\sqrt{x^2-1}}$$

$$\frac{d}{dx}[\sinh^{-1} x] = \frac{1}{\sqrt{1+x^2}}$$

$$\frac{d}{dx}[\cosh^{-1} x] = \frac{1}{\sqrt{x^2-1}}$$

$$\frac{d}{dx}[\tanh^{-1} x] = \frac{1}{1-x^2}$$

$$\frac{d}{dx}[\operatorname{sech}^{-1} x] = \frac{-1}{x\sqrt{1-x^2}}$$

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

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

$$\int \sinh u \, du = \cosh u + C$$

$$\int \cosh u \, du = \sinh u + C$$

$$\int \operatorname{sech}^2 u \, du = \tanh u + C$$

$$\int \operatorname{sech} u \tanh u \, du = -\operatorname{sech} u + C$$

$$\int \frac{1}{\sqrt{a^2-u^2}} \, du = \arcsin \frac{u}{a} + C$$

$$\int \frac{1}{u^2+a^2} \, du = \frac{1}{a} \arctan \frac{u}{a} + C$$

$$\int \frac{1}{u\sqrt{u^2-a^2}} \, du = \frac{1}{a} \operatorname{arcsec} \frac{u}{a} + C$$

$$\int \frac{1}{\sqrt{u^2+a^2}} \, du = \sinh^{-1} \frac{u}{a} + C$$

$$\int \frac{1}{\sqrt{u^2-a^2}} \, du = \cosh^{-1} \frac{u}{a} + C$$

$$\int \frac{1}{a^2-u^2} \, du = \frac{1}{a} \tanh^{-1} \frac{u}{a} + C$$

Integrate each of the following indefinite or definite integrals. For the definite integrals, you should give an *exact* answer, rather than a decimal approximation. To receive full credit, you must show sufficient work for each of your answers. (10 points each)

1. $\int \frac{\sin^3 x}{\cos x} dx$

2. $\int \sec^2 x \tan^3 x dx$

3. $\int x^2 e^x \, dx$

4. $\int x e^{x^2} \, dx$

5. $\int_0^1 \frac{\arctan x}{1+x^2} dx$

6. $\int \frac{1}{4x^2+25} dx$

7. $\int \frac{x}{\sqrt{25 - 16x^2}} dx$

8. $\int_0^2 \frac{1}{\sqrt{16 - 4x^2}} dx$

9. $\int \frac{1}{\sqrt{e^{2x} - 1}} dx$

10. $\int \frac{\sinh x}{1 + \cosh x} dx$