

# Welcome to Math 8: Calculus of Functions of One and Several Variables

September 19, 2006

Lecture 1, September 20, 2006

Marius Ionescu
318 Kemeny Hall
MW 4-5:30&Tu 10-11

- Each student should have received an email with there WeBWork login and password. If, by the first day of class, you have not received your WeBWork details, email me your full name and student id.
- Solutions for odd-numbered problems: <http://hotmath.com/>
- More info on the class web page:  
<http://www.math.dartmouth.edu/~m8f06/>

# Important Integrals

$$\int x^n dx = \frac{x^{n+1}}{n+1} + C \quad n \neq -1$$

$$\int e^x dx = e^x + C$$

$$\int \sin x dx = -\cos x + C$$

$$\int \sec^2 x dx = \tan x + C$$

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

$$\int \frac{1}{x^2+a^2} dx = \frac{1}{a} \tan^{-1}\left(\frac{x}{a}\right) + C$$

$$\int \frac{1}{x} dx = \ln |x| + C$$

$$\int a^x dx = \frac{a^x}{\ln a} + C$$

$$\int \cos x dx = \sin x + C$$

$$\int \csc^2 x dx = -\cot x + C$$

$$\int \cot x dx = -\ln |\sin x| + C$$

$$\int \frac{1}{\sqrt{a^2-x^2}} dx = \sin^{-1}\left(\frac{x}{a}\right) + C$$

# Integration by parts

- The *Product Rule*:

$$\frac{d}{dx}[f(x)g(x)] = f(x)g'(x) + g(x)f'(x)$$

# Integration by parts

- The *Product Rule*:

$$\frac{d}{dx}[f(x)g(x)] = f(x)g'(x) + g(x)f'(x)$$

- **Formula for Integration by Parts:**

$$\int f(x)g'(x)dx = f(x)g(x) - \int g(x)f'(x)dx$$

$$\int u dv = uv - \int v du.$$

# Examples

- $\int \ln x dx$

# Examples

- $\int \ln x dx$
- $\int x^2 \cos x dx$



# Examples

- $\int \ln x dx$
- $\int x^2 \cos x dx$
- $\int e^x \cos x dx$

# Examples

- $\int \ln x dx$
- $\int x^2 \cos x dx$
- $\int e^x \cos x dx$
- $\int x \arctan(4x) dx$

# Examples

- $\int \ln x dx$
- $\int x^2 \cos x dx$
- $\int e^x \cos x dx$
- $\int x \arctan(4x) dx$
- $\int x \ln x dx$

# Examples

- $\int \ln x dx$
- $\int x^2 \cos x dx$
- $\int e^x \cos x dx$
- $\int x \arctan(4x) dx$
- $\int x \ln x dx$
- $\int x \sec^2 x dx$

Examples ...

- Find a reduction formula for

$$\int \cos^n x dx$$