

Test 1

Fri Sept 29

Bring calculator.

Bring music/earplugs.

Practice Problems on website.

Covers	1.2-1.5	Limits
	2.2-2.4	Polynomial / Trig Derivatives
	5.1	Exp / Log Derivatives
	2.5	Implicit Differentiation
	4.4-4.5	Polynomial Integrals
	5.2, 5.4	Exp / Log Integrals
	5.7	Inverse Trig Derivatives
	5.8	" Integrals
	8.1	Basic Trig Integrals

5.8 Cont'd

Ex: Find

$$\int \frac{2x+8}{x^2+2x+10} dx$$

$$\begin{aligned} & x^2+2x+10 \\ &= x^2+2x+1+9 \\ &= (x+1)^2+3^2 \end{aligned}$$

$$= \int \frac{2x+8}{(x+1)^2+3^2} dx$$

$$\begin{aligned} u &= x+1 \\ du &= dx \\ 2x+8 &= ? \\ 2x+8 &= ?(x+1) + ? \\ &= 2(x+1) + 6 \\ &= 2u + 6 \end{aligned}$$

$$= \int \frac{2u+6}{3^2+u^2} du$$

$$= \int \left[\frac{2u}{3^2+u^2} + \frac{6}{3^2+u^2} \right] du$$

$$= \ln|3^2+u^2| + \frac{6}{3} \tan^{-1} \frac{u}{3} + C$$

$$= \ln|3^2+(x+1)^2| + 2 \tan^{-1} \frac{x+1}{3} + C$$

5.8 #17

$$\int \frac{1}{\sqrt{x}\sqrt{1-x}} dx$$

$$= \int \frac{1}{\sqrt{x} \sqrt{1-\sqrt{x}^2}} dx$$

$$\begin{aligned} u &= \sqrt{x} \\ du &= \frac{1}{2} x^{-1/2} dx \\ 2 du &= \frac{dx}{\sqrt{x}} \end{aligned}$$

$$= 2 \int \frac{du}{\sqrt{1-u^2}}$$

$$= 2 \sin^{-1} u + C$$

$$= 2 \sin^{-1} \sqrt{x} + C$$

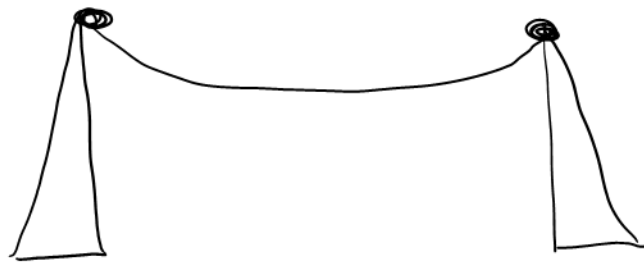
5.9 Won't Be Tested

Hyperbolic Functions

Hyperbolic cosine $\cosh x = \frac{e^x + e^{-x}}{2}$

Hyperbolic sine $\sinh x = \frac{e^x - e^{-x}}{2}$

Quick Ex: Hanging cable



$y = a \cosh\left(\frac{x}{a}\right), a > 0$
The shape is called a catenary.

$(\cosh t, \sinh t)$ lies on
the hyperbola $x^2 - y^2 = 1$.
Hence the name
"hyperbolic functions."

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

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

$$\int \cosh x \, dx = \sinh x + C$$

$$\int \sinh x \, dx = \cosh x + C$$

Ex: Find y'

a) $y = \sinh x^3$

$$y' = 3x^2 \cosh x^3$$

b) $y = x^2 \cosh 5x$

$$\begin{aligned} y' &= x^2 [\sinh 5x (5)] + (\cosh 5x)(2x) \\ &= 5x^2 \sinh 5x + 2x \cosh 5x \end{aligned}$$

Ex:

a) $\int \cosh 4x \, dx$

$$= \frac{1}{4} \int \cosh u \, du$$

$$= \frac{1}{4} \sinh u + C$$

$$= \frac{1}{4} \sinh 4x + C$$

$$\begin{aligned} u &= 4x \\ du &= 4dx \\ \frac{du}{4} &= dx \end{aligned}$$

$$b) \int x^6 \sinh x^7 dx$$

$$u = x^7$$
$$du = 7x^6 dx$$
$$\frac{du}{7} = x^6 dx$$

$$= \frac{1}{7} \int \sinh u du$$

$$= \frac{1}{7} \cosh u + C$$

$$= \frac{1}{7} \cosh x^7 + C$$

8.1 Basic Trig Integrals

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

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

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

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

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

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

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

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

$$\int \csc x \cot x \, dx = -\csc x + C$$

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