Chapter 5

Section 5.2 - Antiderivatives

"You must unlearn what you have learned."

Antiderivative

A function F(x) is an **antiderivative** of f(x) if

$$F'(x) = f(x)$$

Examples: Find F(x) given the functions f(x) below:

$$f(x) = x^{2} \implies F(x) = \frac{1}{3} \chi^{3} + C$$

$$f(x) = 3x^{5} \implies F(x) = \frac{1}{3} \chi^{6} + C$$

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$$f(x) = \cos x \implies F(x) = \sin x + C$$

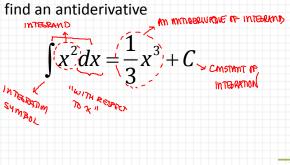
Learning Objectives

- 1. Given a function, be able to find the antiderivative.
- 2. Certain antiderivatives <u>must</u> be memorized make sure you do so (I smell a pop quiz.)
- 3. Given a function, rewrite into a form such that finding an antiderivative is possible.
- 4. Make sure you understand the new notation associated with **integration**.

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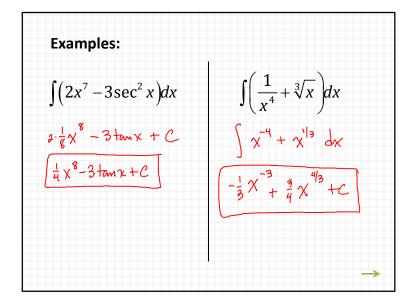
Integration:

- The process of finding antiderivatives
- New notation tells us when we need to find an antiderivative



| Differentiation | Integration |
|---|--|
| $\frac{d}{dx}(x) = 1$ | $\int 1 dx = \chi + C$ |
| $\frac{d}{dx}\left(\frac{1}{n+1}x^{n+1}\right) = x^n$ | $\int x^n dx = \frac{1}{n+1} x^{n+1} + C \text{ Power} $ $(n \neq -1)$ |
| $\frac{d}{dx} \left(\sin x \right) = \cos x$ | $\int \cos x dx = \sin x + C$ |
| $\frac{d}{dx}(\cos x) = -\sin x$ | $\int \sin x dx = -\cos x + C$ |
| | → |

| Differentiation | Integration |
|------------------------------------|-----------------------------------|
| $\frac{d}{dx}(tanx) = sec^2X$ | $\int \sec^2 x dx = toux + C$ |
| $\frac{d}{dx}(\cot x) = -\csc^2 x$ | $\int \csc^2 x dx = -\cot x + C$ |
| $\frac{d}{dx}$ (seex) = secretarix | $\int seex taux dx = seex + C$ |
| $\frac{d}{dx}(csex) = -csexcotx$ | Screentx dx = -crex + C |



Properties of Integrals

$$\frac{d}{dx} \left[\int f(x) dx \right] = \int f(x) dx$$

$$\int (cf(x)) dx = \int f(x) dx$$

$$\int (f(x) \pm g(x)) dx = \int f(x) dx \pm \int g(x) dx$$

$$\int (x+2)(x+3)dx$$

$$\int (x+2)(x+3)dx$$

$$\int (x+1)(x+3)dx$$

$$\int (x+3)(x+3)dx$$

$$\int (x$$

Examples:

$$\int \sqrt{x} (x+3) dx$$

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

$$\int x^{3|a} + 3x^{1|a} dx$$

$$\int \frac{2}{5} x^{3|a} + 2x^{3|a} dx$$

$$sin^2x + cos^2x = 1$$

 $1+cos^2x = csc^2x$
 $1+tam^2x = sec^2x$

$$\int \cot^2 x \, dx$$

$$\int \csc^2 x - 1 \, dx$$

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Homework/Classwork:

- 1. Classwork Section 5.2 WS
- 2. Homework p. 256 #1-29 odd, 45, 47