



A Modular Presentation System for the Calculus Sequence

4.10 Antiderivatives

Yaw Chang

Michael Freeze

Mathematics and Statistics UNC-Wilmington

Definition

▢ Definition

- ▢ Finding Antiderivatives
- ▢ Property of Antiderivative
- ▢ Differential Equations
- ▢ Examples

A function $F(x)$ is called an *antiderivative* of $f(x)$ on an interval (a, b) if $F'(x) = f(x)$ for all x in (a, b) .



Finding Antiderivatives

- Definition
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Find an antiderivative for the following:

1. $f(x) = \sin x$

2. $f(x) = 1/x$

3. $f(x) = x^n, n \neq -1$

Property of Antiderivative

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Theorem

If $F(x)$ is an antiderivative of $f(x)$ on an interval (a, b) , then so is $F(x) + c$ where c is an arbitrary constant.

Note: If $F(x)$ is an antiderivative of $f(x)$. We will write the general form of the antiderivative as $F(x) + c$.



Differential Equations

- ▢ Definition
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Differential Equation: An equation involves the derivative of a function.

General Format: Find $F(x)$ such that $F'(x) = f(x)$ and $F(a) = b$ (initial condition).

Examples

- ▢ Definition
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Example: Find all the function g such that

$$g'(x) = 4 \sin x - 3x^5 + 6\sqrt[4]{x^3}$$

Example: Find f if $f(0) = -2$ and

$$f'(x) = e^x + \frac{20}{1+x^2}$$