

Objective

Students will...

- Be able to find the antiderivatives.
- Be able to use integral notation.
- Be able to come up with general and particular solutions to differential equations.

Antiderivatives

Summit ist

One of the key components in mathematics is being able to revert a process. So, naturally, if we can take the derivatives of a function, we should be able to "undo" it. This is what antiderivatives are. "

Antiderivative- A function F is an antiderivative of f on an interval I if

Antiderivative - A function
$$F$$
 is an antiderivative of f on an interval $F'(x) = f(x)$ for all x in I .

Ex. If $f(x) = 3x^2$, then possibly, $F(x) = x^3 = 7$ $F'(x) = 3x^2 + (x)$

Note: Notice the word "possibly," because there are almost always multiple antiderivatives. From the above example,

If $f(x) = 3x^2$, then it is also possible that $F(x) = x^3 - 89$

The "Anti-Power Rule"

The Power Rule is probably the easiest and the simplest derivative rule. The antiderivatives involving the Power Rule is also quite simple.

Consider...

Ex.
$$f(x) = 3x^2 = 2(3x^{2-1}) = bx'$$

$$f(x) = (a^{x} = (x))(a^{x-1}) = f(x) = (a^{x} = (a^{x} + (a^{x} = a^{x})) = bx'$$

Thus, the "Anti-Power Rule" is as follows:

If
$$f(x) = cx^a$$
, then $F(x) = \frac{C}{(x+1)} x^{(x+1)}$

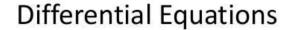
Example

Find the antiderivatives of the following:

$$a. f(x) = |x^2|$$

$$b. f(x) = 5x^3 - 8x^2 + 9x^6$$

$$F(x) = \frac{5}{4}x^4 - \frac{8}{3}x^7 + 9x + C$$



Finding the antiderivatives can be presented in multiple ways. One of the ways is by way of differential equations.

Ex. Find the general solution of the differential equation y'=2

Example

Find the particular solution of $f(x) = \frac{1}{x^2}$, with x > 0 and the initial condition F(1) = 0.

Homework 11/28