

4.9 Antiderivatives

Definition

A function F is an antiderivative of f on interval I

if $F' = f$

$$\frac{d}{dx}(F) = F' = f$$

↑
antiderivative of f

Example

$f = 2x$ what is the antiderivative of f

$$\frac{d}{dx}(x^2) = 2x$$

derivative (pointing to 2x)
antiderivative (pointing to x^2)

so x^2 is an antiderivative of $2x$

observe

$$\frac{d}{dx}(x^2 + 5) = 2x$$

$x^2 + 5$ is an antiderivative of $2x$

$$\frac{d}{dx}(x^2 - 2) = 2x$$

$x^2 - 2$ is an antiderivative of $2x$

So $x^2 + C$ is the most general antiderivative of $2x$ where C is a constant

Theorem

If F is an antiderivative of f on I . Then the most general antiderivative of f on I is

$$F(x) + C \quad (C \text{ is a constant})$$