

5.2 The Natural Logarithm Function and Integration

Thm. Let u be a differentiable function of x then,

$$1. \int \frac{1}{x} dx = \ln|x| + C$$

$$2. \int \frac{1}{u} du = \ln|u| + C$$

ex. Find the average value of the function $y = \frac{4}{2x+1}$ on the interval $[0,2]$.

ex. $\int \frac{x}{x^2+4} dx$

ex. Find the area under the curve $y = \frac{x^2 + \frac{1}{3}}{x^3 + x}$
from $x=1$ to $x=3$ and above the x axis.

$$\left(\frac{1}{3}\right)\ln(90) - \left(\frac{1}{3}\right)\ln(6)$$

.9026834004

ex. Can you figure out this joke? $\int \frac{d(\text{cabin})}{\text{cabin}} dx$

Answer

ex. $\int \frac{x^2+x+1}{x^2+1}$

$$\text{ex. } \int \frac{(\ln x)^5}{x} dx$$

$$\text{ex. } \int \tan x \, dx$$

Integrals of Trig Functions

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

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

$$\int \tan x \, dx = -\ln|\cos x| + C$$

$$\int \cot x \, dx = \ln|\sin x| + C$$

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

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

$$\text{ex. } \int \sqrt{1 + \tan^2 x} \, dx =$$

$$\text{ex. } \int \frac{1}{2x \ln x^3} \, dx =$$

$$\text{ex. } \int \frac{\sec^2 x}{\tan x} dx$$

$$\text{ex. } \int \frac{x^2 - 4}{x} dx$$