Carleton UNIVERSITY
Canada's Capital University

Mathematics Tutorial Series
Integral Calculus #6

Basic Anti-derivatives

Remember the Table of Key Derivatives:

f	f'
c, constant	0
x^m	mx^{m-1}
$\sin x$	$\cos x$
$\cos x$	$-\sin x$
$\tan x$	$\sec^2 x$
$\sec x$	$\sec x \tan x$
e^x	e^x
$\log x$	$\frac{1}{x}$
$\sin^{-1} x$	$\frac{1}{\sqrt{1-x^2}}$
$\tan^{-1} x$	$\frac{1}{1+x^2}$

Switch the columns.

This becomes a Table of Key Anti-derivatives.

f	Anti-derivative of f
0	c, constant
mx^{m-1}	x^m
x^m	$\frac{1}{m+1}x^{m+1}$
$\cos x$	$\sin x$
$-\sin x$	$\cos x$
$\sec^2 x$	$\tan x$
$\sec x \tan x$	$\sec x$
e^x	e^x
$\frac{1}{x}$	$\log x$
$\frac{1}{\sqrt{1-x^2}}$	$\sin^{-1} x$
$\frac{1}{1+x^2}$	$\tan^{-1} x$

Examples:

1.

$$\int \sec^2 x \, dx = tan\, x + c$$

and so

$$\int_0^{\pi/4} \sec^2 x \, dx = tan\, \frac{\pi}{4} - tan\ 0 = 1 - 0 = 1$$

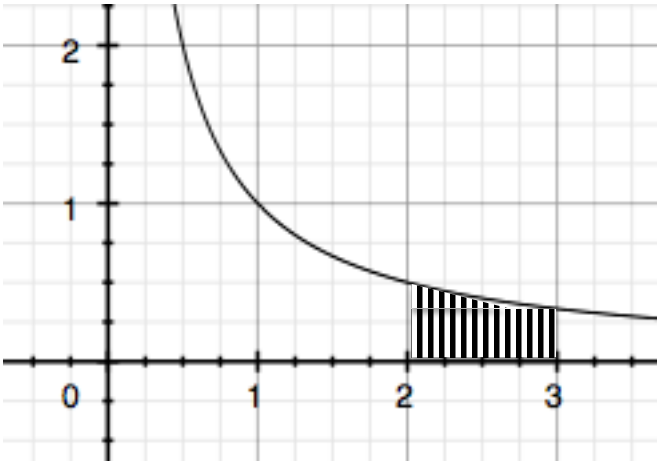
2.

$$\int \frac{1}{x} dx = \log x + c$$

and so

$$\int_2^3 \frac{1}{x}\,dx = \log 3 - \log 2 = 0.4055$$

This number is the area under the graph of $y = \frac{1}{x}$ between $x = 2$ and $x = 3$.



3.

$$\int 1\,dx = x + c$$

Summary

1. A definite integral can be calculated once we have an anti-derivative of the integrand.

2. What we know about derivatives can help us construct anti-derivatives.

3. $\int f(x)\,dx$ is a function plus a constant.

4. $\int_a^b f(x)\;dx$ is a number.