IB Math SL Notes **Intro to Integral Calculus!**

Unit 4 – Day 1

1. **What is Integration?**

*Integration is the act of working backwards – you are given the derivative, f’(x), and asked to come up with the function, f(x). This is also called “anti-differentiation.”*

**Applications:**

* finding position function given velocity function
* finding areas with curved boundaries
* finding work done by a force, etc.

This process is not necessarily straight forward…

Consider: f’(x) = 2x. What function, f(x), has this derivative?

So, when finding the anti-derivative, we use “+c” at the end where $c\in R$ and is called “the constant of integration”.

**Ex 1:** Find the anti-derivative of:

1. f’(x) = 3x2 + 6x – 4 b) f’(x) = x3 – 3x2 – 5x + 7 c) f’(x) = x4 + 6x2 – 3

**Ex 2:** *(#4 from your review sheet):* The velocity, *v* m s−1, of a moving object at time *t* seconds is given by *v* = 4*t*3 − 2*t*. When *t* = 2, the displacement, *s*, of the object is 8 metres. Find an expression for *s* in terms of *t*.

**Ex 3:** Write a general expression for finding the anti-derivative of a polynomial.

Summary of basic mother-function anti-derivatives:

|  |  |
| --- | --- |
| *f'(x)* | *f(x)* |
| xn |  |
| x-1 |  |
| ex |  |
| sin x |  |
| cos x |  |

1. **![C:\Documents and Settings\afischer\Local Settings\Temporary Internet Files\Content.IE5\XWNGKX27\MC900048212[1].wmf]()Indefinite Integration:**

Because we don’t know what the value of “c” is, the process is called indefinite.

The act of finding an integral is a summation process (to be discussed more later),

so the symbol for integration is an ‘S’ type shape (shown at right).

Notation:  means f(x) is to be integrated.

Right now, we will think of the “*dx*” as a way of indicating to us that the function we see written in the problem has already been differentiated with respect to *x*. This notation is important for higher levels of calculus when you have multiple variables in one problem. (There are other meanings of the *dx* which we will discuss later).

\*There are **NO** product or quotient rules for integration, so some of these take a bit more work.

**Rules that do work:**

* When integrating a sum or difference, you ***integrate each of the terms then add/subtract results***
* Also, for constants,

**Ex:** Find the following:

1.  2. 3. 

4.  5.  6. 

7.  8.  9.