**WHY ARE WE STILL MESSING ABOUT WITH SECS?**

I recently found a 1946 copy of Cambridge Four Figure Mathematical Tables and noticed there was a table of SECANTS as well as Sines, Cosines and Tangents.



I assume that in those days they used five or six trigonometric ratios instead of just the three that we use today. If so, finding the hypotenuse of a triangle could have been done without transposing the equation.

eg

 ***x***

 600

 7cm

|  |  |
| --- | --- |
| **Today’s Method:** ***cos60 = 7*** ***x*** ***x = 7 .*** ***cos60*** ***x = 7 .***  ***0.5*** ***x = 14 cm*** | **1946 Method:** ***x = sec 60*** ***7***  ***x = 7sec60*** ***x = 7 × 2*** ***x = 14 cm*** |

It then occurred to me, why do we even bother using ***sec, cosec*** and ***cot*** in our Year 13 Calculus course? In fact why does ANYONE still use them?

**We do not actually need these archaic quantities at all!**

The formula sheet tells us that the derivative of ***tan x*** is ***sec2x.***

To be quite realistic, this result means very little to a normal 17 year old.

(Just ask a typical student to work out sec2(π/4) and you will very probably be confronted by a blank expression.)

What is wrong with putting the derivative of ***tan x = 1 . ?***

 ***cos2x***

This is far more meaningful.

**In fact, we should be concentrating on teaching students WHY this is true, NOT just finding the result on a formula sheet!**

***If y = tan x = sin x***

 ***cos x***

 ***dy = cos x ( cos x) – sin x ( – sin x) = cos2x + sin2x = 1 .***

 ***dx cos2x cos2x cos2x***

The Differentiation table on the formula sheet should just be as follows:

|  |  |
| --- | --- |
| ***y = f(x)*** | ***dy = f ꞌ(x)*** ***dx*** |
| ***ln(x)******eax******sin x******cos x******tan x*** | ***1******x******aeax******cos x******– sin x******. 1 .******cos2x*** |

There should be no mention of ***sec x*** becoming ***sec x tan x***  etc

If we require the derivative of ***. 1 .*** tthen we should just differentiate it!

 ***cos x***

***eg y = (cos x) – 1***

 ***dy = – (cos x) – 2 × ( – sin x) = sin x***

 ***dx cos2x***

(Of course, this equals ***sec x tan x*** but is in a far more meaningful form!)

If anyone is concerned about integrals such as

you should remember that **sec, cosec** and **cot** are basically **redundant,**

**archaic quantities**.

The above integral can actually be written as:

We simply let ***u = cos x***

 ***du = – sinx dx***

and the integral becomes:

 =

 ***= 1 + c***

 ***u***

 ***= 1 .+ + c***

 ***cos x***

The above expression was integrated using the simple substitution ***u = cos x***

In fact some people even do this mentally. Either way, this is an integral **worthy of being in a calculus course.**

However, in its original form, what is the benefit in just looking at the formula sheet and writing: = ***sec x*** + c