TI-89/TI-89 Platinum/Voyage 200 tutorial

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March 17, 2005

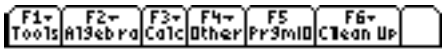
The TI-89 is a great calculator. By a great calculator I mean that it is one of the best calculators you can find at the moment. Another great calculator is the HP 49g+ which is the first calculator to include an SD expansion Card.
The TI-89 will be a calculator that will assist you for many years to come. This short tutorial will let you be familiarized with some of the features of the calculator. The calculator main reference remains the TI-89 guidebook.
P.S. : I will use the TI-89 for simplification but the other calculators like the TI-89 Platinum and Voyage 200 are also concerned by the tutorial.

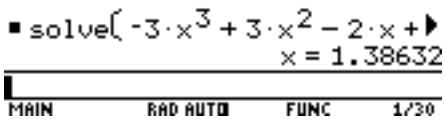
Contents

1 Solving equations & system of linear equations

Suppose we want to solve the following equation: $-3x^3 + 3x^2 - 2x + 5 = 0$
The syntax is:

```
solve(-3x^3+3x^2-2x+5=0,x)
or
zeros(-3x^3+3x^2-2x+5,x)
```



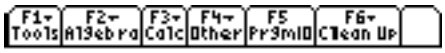


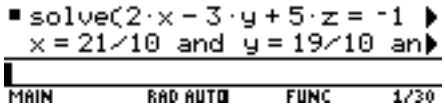
I have written ",x" after the equation because the variable to solve for in this equation is x
Suppose we want to solve the following system of linear equations:

$$\begin{aligned} 2x - 3y + 5z &= -1 \\ -3x + 5y - 2z &= 3 \\ 5x - 7y + 8z &= -2 \end{aligned}$$

The syntax is :

```
solve(2x+3y+5z=-1 and -3x+5y-2z=3 and 5x-7y+8z=-2,x,y,z)
or
zeros(2x+3y+5z+1 ,-3x+5y-2z-3 ,5x-7y+8z+2,x,y,z)
```



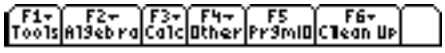


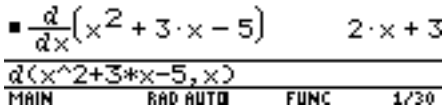
2 Derivation & Integration

2.1 Derivation

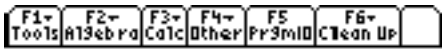
Suppose we want to compute the derivative of : $x^2 + 3x - 5$
The syntax is:

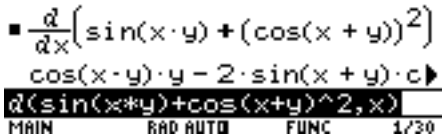
```
d(function,variable,degree)
```
degree can be omitted, it's 1 by default





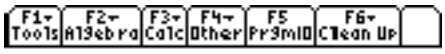
Compute the partial derivative f_x of $f(x) = \sin xy + \cos^2(x + y)$





2.2 Integration

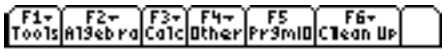
Let's say we want to compute $\int \sin x$:

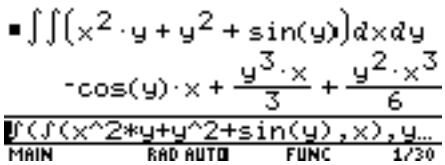


Compute

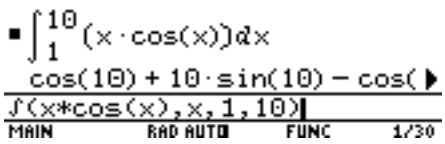
$$\iint x^2y + y^2 + \sin y \, dxdy$$

To do that on paper we first integrate for x supposing y constant then we integrate for y supposing x constant





Let's say we want to compute the value of following integral $\int_1^{10} x \cos x$:



3 Limits, sums & Taylor series

3.1 Limits

Suppose we want to compute:

$$\lim_{x \to \infty} x^2$$

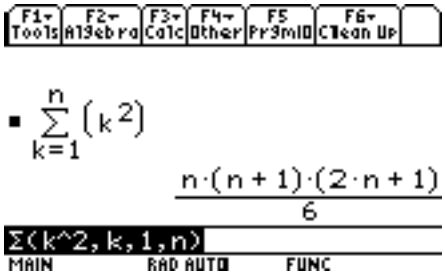
The syntax is:

`lim(function,variable,point,direction)`
direction is either 1 or -1 and can be omitted
1: limit from right
-1: limit from left

3.2 Sum

Compute

$$\sum_{i=1}^{n} k^2$$

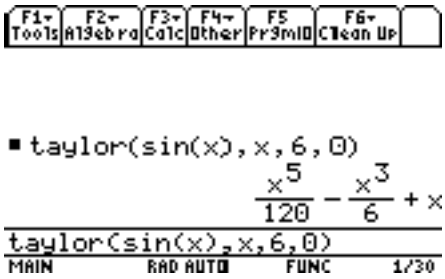


3.3 Taylor series

The syntax for computing Taylor series is:

`taylor(function,variable,degree,point)`
point can be omitted , it is 0 by default

Suppose we want to know the 6^{th} degree Taylor expansion of $\sin x$ around 0:



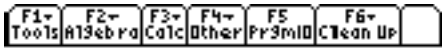
4 Polynomials

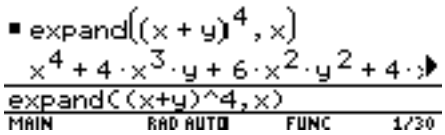
4.1 Expanding polynomials

The syntax is

`expand(polynomial,variable)`

Let's say we want to expand $(x+y)^4$



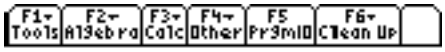


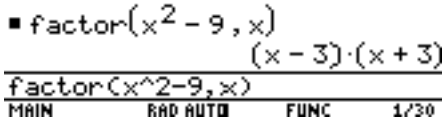
4.2 Factoring polynomials

The syntax is:

```
factor(function,variable)
```

Let's factor the function $x^2 - 9$

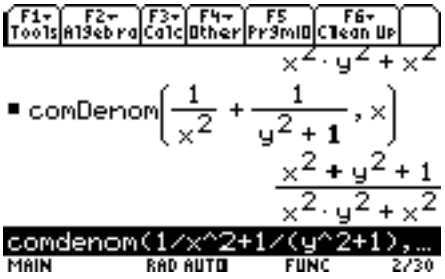




4.3 Common denominator

Let's put on the same denominator the function:

$$f(x,y) = \frac{1}{x^2} + \frac{1}{y^2+1}$$



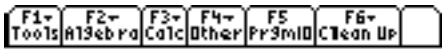
5 Number operations

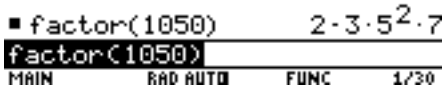
5.1 Factoring a number

The syntax is:

```
factor(number)
```

Let's factor the number 1050 for example:





5.2 Finding the GCD & LCM

The syntax is:

```
gcd(number1,number2) lcm(number1,number2)
```

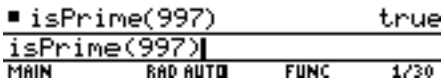
To find the GCD & LCM of 3 numbers the syntax is:

```
gcd(gcd(number1,number2),number3)
lcm(lcm(number1,number2),number3)
```

5.3 Testing if a number is prime or not

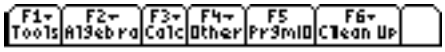
```
isPrime(number)
```

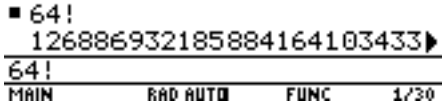
Let's see if 997 is prime or not



5.4 Finding the factorial of a number

Let's find : 64!





6 Differential Equations

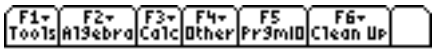
Let's solve the following differential equation:

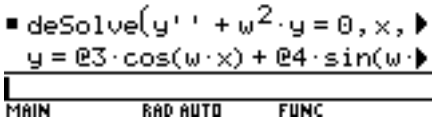
$$x'' + \omega^2 x = 0$$

The syntax is:

deSolve(function,x,y)

We must rename x to y





Note that the result is: $@3cos(w.x) + @4sin(w.x)$ @3 and @4 are constants like the constants c_1, c_2, ... etc used in Mathematics courses.

7 Sequence

Suppose we want to find the terms of the following sequence:

$$U_{n+1} = 2U_n + 2, \quad U_0 = 2$$

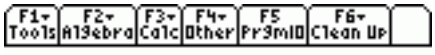
We can use 2 methods: the *when* function or by using the *Sequence mode* of the calculator.

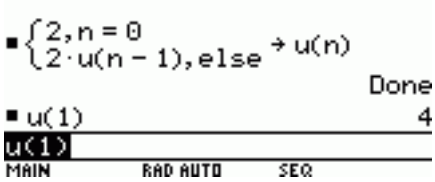
7.1 The when() function

The syntax of this function is:

when(condition,true value,false value,unknown value) *false value* & *unknown value* can be omitted.

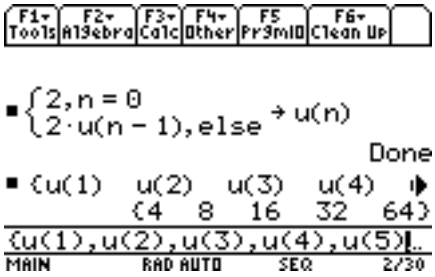
`when(n=0,2,2u(n-1)+2)` → `u(n)`
The sign → is to store the function in `u(n)`
To compute u_1, we write : `u(1)`





Suppose we want to find the 5 first terms of the sequence, we should write:

```
u(1),u(2),u(3),u(4),u(5)
```

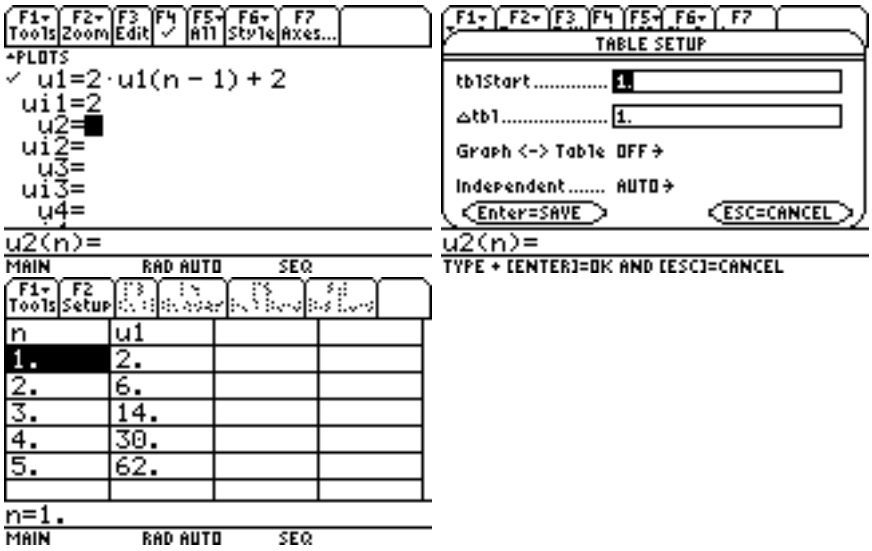


7.2 Using the Sequence mode

Let's take the previous example:
The syntax is:

$$U_1 = 2U_{n-1} + 2, \quad U_{i1} = 2$$

U_{i1} is the initial term



Note that the table starts at 1 so U_0 is equal to $n = 1$ on the calculator ,there is a shift of 1 between the calculator and the real world.