

# Mathematica CalcCenter

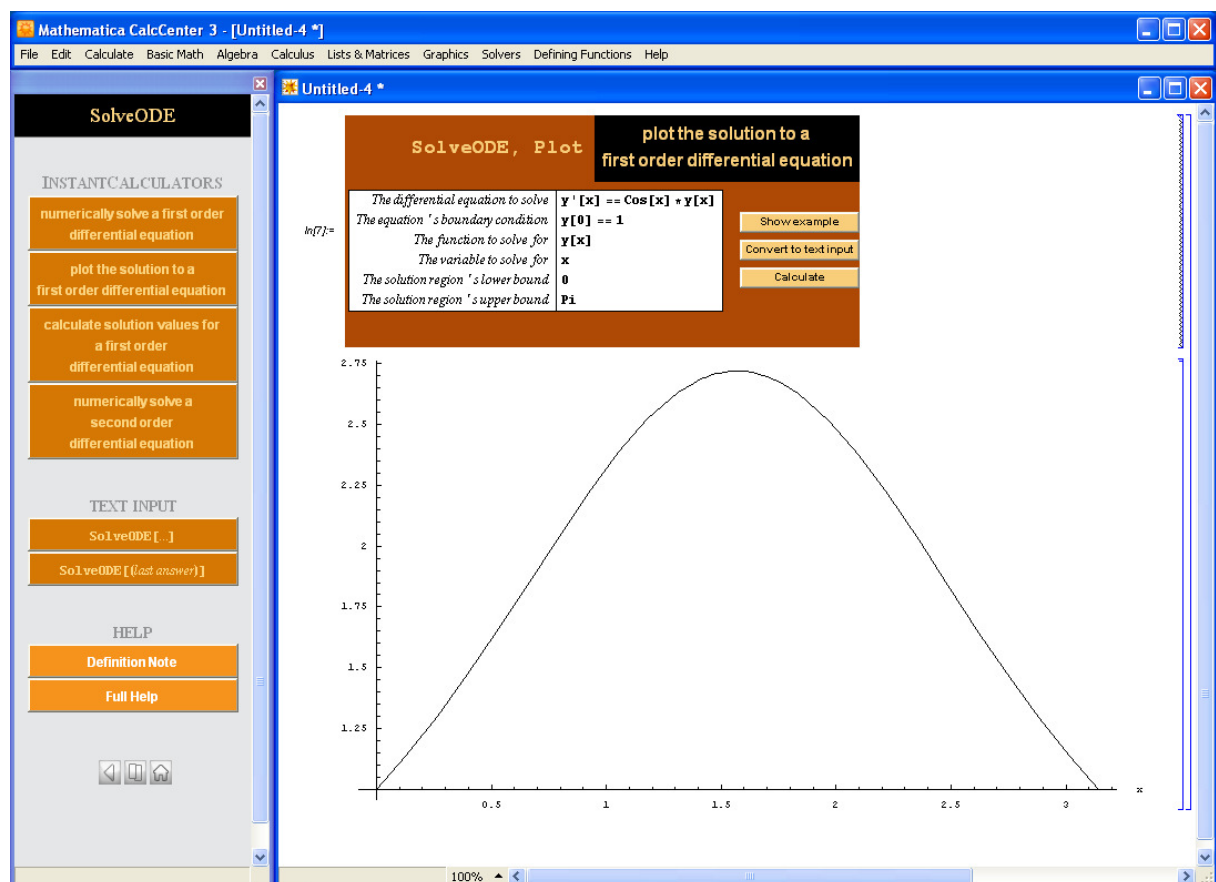
## Basic features

Wolfram Mathematica CalcCenter is based on *Mathematica Professional* and it is primarily designed for technical calculations. Information about this product can be found and a trial version can be downloaded from the web pages of Wolfram research — see:

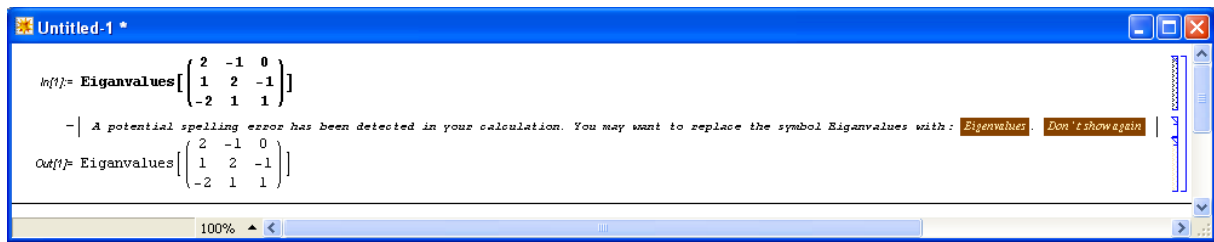
<http://www.wolfram.com/products/calccenter/>

*Mathematica CalcCenter* uses the standard MathKernel, but many of its functions are disabled. On the other hand, the front-end offers many facilities, most of which are not available in *Mathematica Professional*:

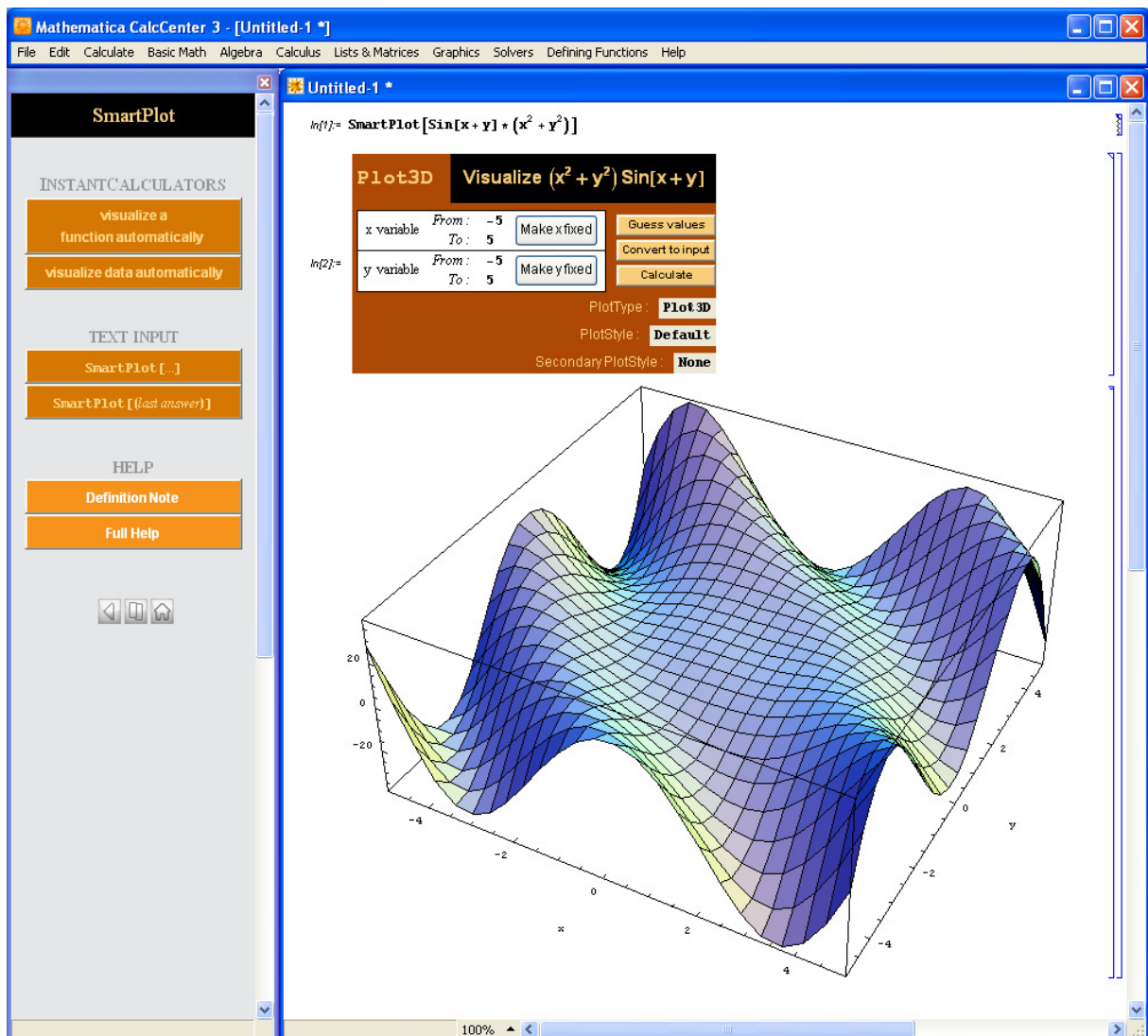
- “InstantCalculator” — each function is provided with a template, which the user can fill in and use to evaluate the function without the need to remember any keyword, sequence of parameters etc. Moreover, the template stays in the document, and so all parameters can be easily changed and the function reevaluated:



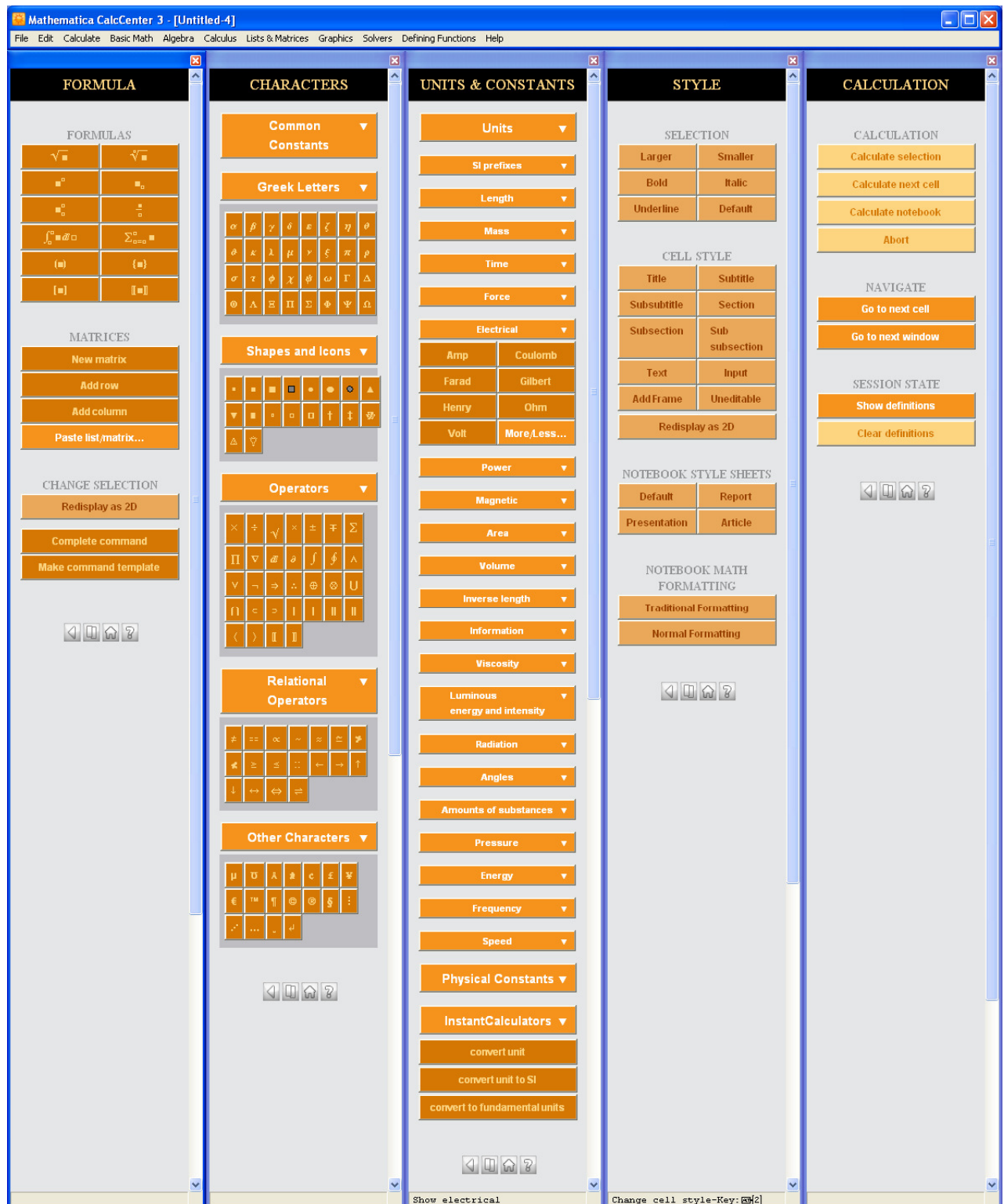
- If the user misprints a keyword, *Mathematica CalcCenter* suggests a nearest alternative:



- “SmartPlot” — the user types only the definition formula of a function and the tool chooses the scale of the axes and appropriate plot type:



- Controllers for easy insertion of formulas, characters, units and constants, style and calculation. Many physical units and constants are predefined to make technical computations easier:



An important advantage of *Mathematica CalcCenter* compared with other packages, such as *Mathematica Professional*, is the much lower price of the license.

## Numbers, Variables

We can work with numbers in a similar fashion to *Mathematica Professional*.

```
In[1]:= 1 + 3
```

```
Out[1]= 4
```

The basic difference is that *Mathematica CalcCenter* always saves the result in IEEE standard floating-point arithmetic (machine precision). Consequently, it does not distinguish between integers and real numbers (1 versus 1. in *Mathematica Professional*), and does not calculate using fractions or irrational numbers:

```
In[2]:= 8 / 7
```

```
Out[2]= 1.142857143
```

```
In[3]:= Sqrt[2]
```

```
Out[3]= 1.414213562
```

We can also use predefined constants and define our own variables:

```
In[4]:= r = 2
```

```
2 * Pi * r
```

```
Out[4]= 2
```

```
Out[5]= 12.56637061
```

Note that *Mathematica CalcCenter* does not work with  $\pi$  symbolically, but it enumerates it. Definition of a user's function looks similarly to *Mathematica Professional*:

```
In[6]:= Clear[r]
```

```
CircleLength[r_] = 2 * Pi * r
```

```
CircleLength[2]
```

```
Out[7]= 6.283185307 r
```

```
Out[8]= 12.56637061
```

If we want *Mathematica CalcCenter* to display the result as a fraction, we can use the command `$ShowFractions=True`:

```
In[21]:= $ShowFractions = True
```

```
Out[21]= True
```

```
In[9]:= 1 / 3 + 1 / 2
```

```
Out[9]=  $\frac{5}{6}$ 
```

This command does not change the fact that *Mathematica CalcCenter* saves the result in machine precision. It only means that when a result is displayed, it is checked whether it is close to a fraction and if yes, this fraction is displayed instead of decimal digits:

```
In[10]:= 0.833333333333
          0.833333333333
```

```
Out[10]= 0.833333333333
```

```
Out[11]=  $\frac{5}{6}$ 
```

## Expressions

*Mathematica CalcCenter* works with undefined variables symbolically, so we can apply some of the functions known from *Mathematica Professional* to work with expressions (note that the symbol % refers to the last result, %n refers to the n<sup>th</sup> result):

```
In[12]:= (a + b)^2
```

```
Out[12]= (a + b)^2
```

```
In[13]:= ExpandAll [%]
```

```
Out[13]= a^2 + 2 a b + b^2
```

```
In[14]:= Simplify [%]
```

```
Out[14]= (a + b)^2
```

```
In[15]:= Simplify [ $\frac{a^3 - b^3}{a - b}$ ]
```

```
Out[15]= a^2 + a b + b^2
```

```
In[16]:= Together [ $\frac{1}{a} + \frac{1}{b}$ ]
```

```
Out[16]=  $\frac{a + b}{a b}$ 
```

If we want to enumerate an expression for concrete values of the variables, we cannot use the replacement rules of *Mathematica Professional*, because they are forbidden in *Mathematica CalcCenter*:

```
In[17]:= %16 /. {a -> 1, b -> 2}
```

- *Mathematica CalcCenter does not support Mathematica style rules* Don't show again
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```
Out[17]=  $\frac{a + b}{a b}$ 
```

We have to define a new function and enumerate it instead:

```
In[18]:= f[a_, b_] = %16
```

$$\text{Out[18]} = \frac{a+b}{a b}$$

```
In[19]:= f[1, 2]
```

$$\text{Out[19]} = 1 + \frac{1}{2}$$

## Solvers

*Mathematica CalcCenter* contains tools for numerical (not symbolical) solutions of algebraic and differential equations. The corresponding functions have names different from those in *Mathematica Professional*, and also the results are obtained in a different form. The reason is that *Mathematica Professional* gives these results in the form of a replacement rule, which is not supported by *Mathematica CalcCenter*.

Algebraic equations can be solved using `SolveEquation` and ordinary differential equations using `SolveODE`:

```
In[20]:= SolveEquation[{x + 2 y == 5, 3 x - y == 1}, {x, y}]
```

$$\text{Out[20]} =$$

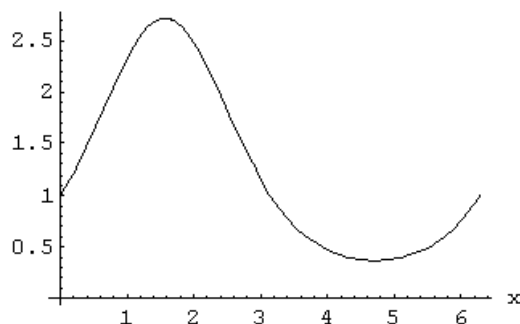
x	y
1	2

```
In[21]:= sol = SolveODE[{y'[x] == Cos[x] * y[x], y[0] == 1}, y[x], {x, 0, 2 Pi}]
```

$$\text{Out[21]} =$$

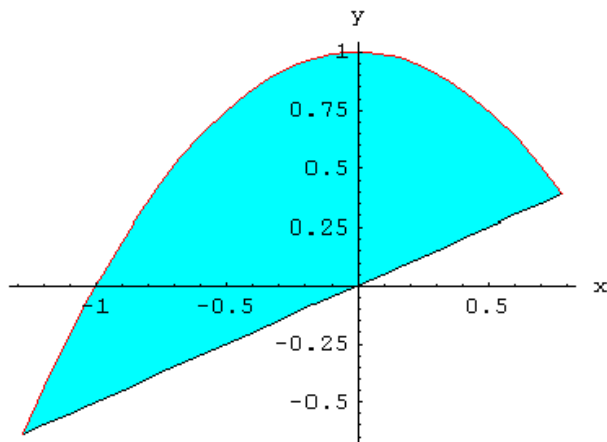
y[x]
InterpolatingFunction[({ 0 6.283185307 }, <>)[x]

```
In[22]:= Plot[sol, {x, 0, 2 Pi}]
```



For graphical solutions of inequalities, *Mathematica CalcCenter* has the function `InequalityPlot`:

```
In[23]:= InequalityPlot[{y < 1 - x^2 && 2 y > x}, {x, -2, 1}, {y, -1, 1}]
```



## Conclusion

*Mathematica CalcCenter* is suitable for teachers who need a simple tool for showing basic technical computations, graphs, curves etc. There is also a possibility to automatically create tests or home works. Much lower price comparing to *Mathematica Professional* makes *Mathematica CalcCenter* reasonable typically for high-school teachers, but it is also suitable for teachers at technical faculties, where mathematics is taught in a needful extent corresponding to particular special problems.