

*AIMS-VOLKSWAGEN STIFTUNG WORKSHOP ON INTRODUCTION
TO COMPUTER ALGEBRA AND APPLICATIONS*

CONTRIBUTED TALK

Use of Computer Algebra System to teach Mathematics

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INTRODUCTION

Definition

A Computer Algebra System (CAS) is any mathematical software with the ability to perform mathematical expressions in a way similar to mathematicians and scientists.

Use of CAS as a tool of teaching

Teaching in mathematics by using software can be a difficult and demanding task for novices learners. The use of CAS in teaching mathematical concepts is a great challenge both from a didactical and a scientific point of view [2].

Concretes examples with MAXIMA

The following are the basic computations and plots with MAXIMA.

```
(%i1) pol:(x+y)^10-(x-y)^10;
```

```
(%o1) (y+x)10-(x-y)10
```

```
(%i2) expand(pol);
```

```
(%o2) 20 x y9+240 x3 y7+504 x5 y5+240 x7 y3+20 x9 y
```

```
(%i3) factor(pol);
```

```
(%o3) 4 x y (y4+10 x2 y2+5 x4) (5 y4+10 x2 y2+x4)
```

```
(%i4) rat:(1-x^10)/(1-x^4);
```

```
(%o4)  $\frac{1-x^{10}}{1-x^4}$ 
```

```
(%i5) ratsimp(rat);
```

```
(%o5)  $\frac{x^8+x^6+x^4+x^2+1}{x^2+1}$ 
```

```
(%i6) factor(rat);
```

```
(%o6)  $\frac{(x^4-x^3+x^2-x+1)(x^4+x^3+x^2+x+1)}{x^2+1}$ 
```

Plotting in 3D with MAXIMA

```
plot3d(x^2 - y^2, [x, -2, 2], [y, -3, 3], [grid, 100, 100], [meshlinescolor, false])
```

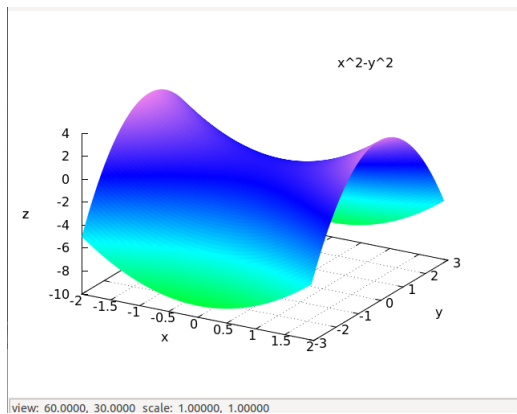


Figure : Plot of a function of two variable in 3D.

Advantages of using Computer Algebra System

Advantages of CAS

There are many benefits of using CAS which some of them are the following [3]:

- ① Helps to develop visual/graphical understanding.*
- ② Can help to increase students motivation and improve students attitudes towards mathematics.*
- ③ Enhances job opportunities for students.*

Drawbacks of using Computer Algebra System

Drawbacks of CAS

Despite the many benefits of using CAS, there are many drawbacks, so that is why many advocate against its use and raise some concerns [3].

We list here some of the drawbacks:

- 1 Students tend to use CAS blindly and do not bother about the validity of answer obtained through CAS.*
- 2 Most often students try to use CAS as an advanced calculator and refuse to learn concepts.*
- 3 CAS at time can produce produce meaningless expressions.*

Computer Algebra System and Teachers

Technology and Teacher

It goes without saying that the classroom teacher is the key to the successful introduction of new methods and technology [1].

Teacher's role

Teachers, of course have a crucial role in students learning with or without Computer Algebra System. The role of teachers is very important in order to make the effectiveness use of available mathematics tools [1].




CONCLUSION


The use of technology in classroom can lead to advance in conceptualization. Integrating technology into a mathematical courses will increase awareness among the students and help them to evaluate and correct themselves.

Traditional teaching methods must be supported with modern tools for mathematical problem-solving.

- 1 To develop methodology for teaching mathematics with CAS.*
- 2 To organize regular workshops, training programmes for mathematics teachers.*
- 3 A lot of research is needed to understanding the students attitudes and psychology of learning mathematics using CAS.*

References

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**Thank you
for your attention**