# WOLFRAM TECHNOLOGY CONFERENCE

# Introduction to Wolfram Mathematica for Teachers

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## Importance of Introduction in general

During our creation of new introduction for our students we have reviewed articles with respect to CAS and factors influencing CAS integration. Main factors are shown in this presentation.

First main factor is introduction done by teacher himself. A lot of introduction to *Mathematica* was written as notebooks and books, but importance of introduction done by teacher himself is little bit underestimated. Introduction like Essential of *Mathematica* by Boccara is well done written introduction but without insight of teacher even this great book can used just a tool without taking into consideration the concepts of *Mathematica* programing and usage. It doesn t mean to make and introduction from scratch, but to realize the important parts of new introduction and its concepts and meaning.

## Focus on...

- Mathematica
- Mathematica with examples of Physics
- Physics
- Mathematica in Physics
- Physics by Mathematica

## Teachers factor

But role of teacher is more complex than just to write introduction by himself. In articles like Henneesy 2005 teachers factor can be one of the key role to incorporated *Mathematica* into curriculum and also its usage. Some of teachers factors are mentioned below

- Attitude to Mathematica
- Open Minded for technologies and its usage
- Teacher s understanding of Mathematica and its concepts
- Be ready to admit I don t know
- Students can know more than teacher

# Three Different Points of View

During our creation of new introduction we considered three different points of view. Those points of view are in some cases the same e.g. visualization of tasks by plots, but it purposes can be different - visualization for yourself or others.

#### Scientist

- Formulas and equations language of science
- Try to visualize problem only for himself
- Use commands and functions useful for him

#### Teacher

- Think of possibilities of commands and functions not only for himself but also for scientist and students. Sometimes also for his colleagues
- Teacher use visualization for his students plots and diagrams have to be understandable for others
- Thinking old fashion way and new way

#### Students

In old fasion way to create the introduction only the scientists and teachers points of view have been used. But also the students point view is useful and worthy of our consideration, because as it is shown in some questionare we made that students consider something as useful (at high school), because it is useful in the future during the studies.

- Tool that help student to pass the exams, test
- Tool that can checked the solutions
- Tool that can help student to see problem for himself
- Functions of Mathematica that are useful for students during their studies

## Introduction to Wolfram Mathematica for Teachers

## Our Context

- Faculty Multilicence of Mathematica for students and staff
- Students are interested in Mathematica
- Mathematica for Beginners, Advanced course in Mathematica (Dr. Slavik)
- Students don t know how to start with Mathematica
- Courses of Mathematica aren t part of obligatory course(s)
- Seminars like Mathematica for Physicist and physics teachers has not been done so far.



## Syllabus

Basic idea of syllabus is to cover topics of math that are needed to understand physics at university level. Basic commands of *Mathematica* like Solve, Integrate ect. are used to solve elementary physics tasks.

- Basic introduction to Wolfram Mathematica
- Solving easy tasks by command Solve
- Derivative velocity and acceleration
- Integral in moments of inertia and center of gravity
- Differential equations in equations of motion
- Visualizations of physics tasks by plots
- Vectors and matrices in physics
- Operators in physics (Grad, Div, Rot and Laplace)
- Interactive change of the tasks command Manipulate
- Notebook appearance, different styles for presentation
- Working with Data import, export, data mining
- Interesting commands for math s tasks
- Advanced programming functional Programming, parallel computing, CUDA
- Tablet and interactive table
- Wolfram|Alpha and Mathematica
- Similar programs to Mathematica and related products

#### Traditional and Modern Topics

Syllabus can be divided into two different - traditional and modern topics. Traditional topics are typically older than 100 years. On the other hand modern topics try to follow newest technology and advantages of new versions of *Mathematica* and products related to CAS. Modern topics are about couple years old (average number).

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## First year

Unofficial seminar for PhD students of Department of Physics Education

- Thursday 5pm to 7(9)pm
- Basic topics basic introduction, equations, plots
- General idea try seminar before official announcement and also have feedback for improvement.

# Acknowledgments

In this place I would like to thank to Institute of Theoretical Physics for support during my work and mostly to the GACR project no. P203/12/0665 MolekulÆní rezonance a jejich dynamika and SVV project no.104 - 09/265310 - Studentský výzkum v oblasti didaktiky fyziky a matematickØno a poŁítaŁovØno modelovÆní.