

WebMathematics Interactive 2

This documentation is a concise description of **WebMathematics Interactive 2 (WMI2)**.

1. What is WMI2?

WMI2 is a web application primarily designed for mathematics education of the age 14–21. Its main authors are the associates of the [Bolyai Institute](#) at the [University of Szeged](#).

The most important purpose of this application is to give help in the learning of mathematics. The underlying mathematical software provide ones of the best mathematical expert knowledge accessible through computational methods. These computer based techniques do not give correct or complete solution in every occasions, but they answer the most practical questions correctly. Because of this, **WMI2**, like any other similar application, is primarily for self-assessment, for getting new ideas, and for solving many routine exercises quickly.

One main purpose of **WMI2** is to be a symbolic computer algebra system with easy usability: no programming expertise should be needed, only minimal mathematical skills. It is clear that this means some compromise at the available types of exercises. But our intention is that the types of the exercises should come from the widest possible range and from the most important practical problems. The users who want to solve more difficult, more complex problems, may probably find it useful to proceed with professional computer algebra systems. Such a next step can be the free [wxMaxima](#) or the commercial [Mathematica](#), which can be programmed in English.

2. How can it be used?

In order to use **WMI2**, only a (relatively modern) web browser is needed. Our suggestion is [Mozilla Firefox](#) 2.0, but *Internet Explorer* 6.0 and 7.0 are completely supported as well.

Basically, the screen of the application is divided into two parts. On the left, under the logo of the program, a calculator can be found, and the exercise to be solved must be typed in its upper row, but this also can be done by merely pressing the buttons of the mouse. The input formula appears immediately on the right, in the worksheet. So the right side is that side of the screen where the formulas of exercises appear, and the solutions of these exercise formulas can be seen here, too. The exercises are displayed in red, and the solutions of them in blue.

The input exercises can be solved by the greenish blue buttons of the calculator. By clicking on the solutions of exercises, they are inserted in the calculator, and this way further operations can be done on them. Copying formulas works on input formulas, too.

On the left many types of calculators can be chosen, depending on what types of exercises are wanted to be solved. The default calculator type is the *secondary school* one, we can solve equations, compute binomial coefficients, determine the greatest common divisor of two numbers, factorize or evaluate expressions. Another calculator types can be chosen by the upper left button of the calculator.

Like the upper left button, some other buttons open submenus. These types of buttons are called groupbuttons. Moving the mouse over a groupbutton, the group of the button appears after a short time, which is a set of some buttons similar to the original one, with the capability of similar functions to solve. So, for example, when moving the mouse over the equation solving button, there is a possibility to plot functions, and beside the greatest common divisor, the least common multiple appears in a similar way. In the group of factorization, we can reach expansion as well.

On the bottom of the worksheet on the right there can be found some icons, with them new worksheets can be started, or the content of the worksheet can be exported to a web document. There is a possibility to print the worksheet, too.

2.1. 6 IMPORTANT TRICKS

We tried to make the web application as user-friendly as possible. However, we collected some useful ideas here, if everything would not be totally clear for the first sight:

- The sign of multiplication (\times) always has to be present, if the formula is inputted by button pressing. If the formula is typed with the keyboard, then the ordinary asterisk character of multiplication can be omitted in some cases.
- When entering equations, the equality sign can be inserted with the mouse by pressing the red-white “=” button located in the middle of most layouts.
- By entering x^2 with the mouse, the x button should be pressed first, and then the x^2 button should be pressed. To type the same formula with the keyboard, x^2 should be written.
- To type decimal fractions, period should be used as decimal separator. The comma button is for separating the inputs, if we wish to enter more numbers or expressions. For example, we use this to enter two numbers for calculating the greatest common divisor of them, or to enter two or more functions for displaying, or the elements of a vector.
- When solving too slowly-computable exercises, **WMI2** refuses the further computation after 10 seconds in order to avoid the overload of the system.
- Matrices can be entered using brackets and commas. Example: $[[1,0,0],[0,1,0],[0,0,1]]$ — this will give you the unit matrix. Do not forget that for multiplying matrices you should use the “.” (period) character.

3. How does it work?

The **WMI2** (WebMathematics Interactive) software runs on a *GNU Linux* server. The Linux server — as many other similar software — runs an *Apache* webserver and a *PostgreSQL* database server. The main parts of **WMI2** are written in the programming language *PHP*, which keep constant communication with the *gnuplot* function plotter and the *Maxima* computer algebra system, and the *TEX/L^ATEX* mathematical typesetting programs and the *ImageMagick* image manipulation software. The formula conversions are done by the *formconv* and the *TEX_{MACS}* softwares. The database of **WMI2** was developed using the *Wekker* web 2.0 application generator. The advertisement system is supported by the *GeoLiteCity* software of *MaxMind* company.

We tried to use the most up-to-date web technologies, and we put everything we could on open-source base. Enquirer users can read further details about this on the webpage <http://sf.net/projects/wmi>.

4. Authors and Copyright

The history of **WMI2** dates back to 2002. Róbert Vajda and Zoltán Kovács, two young assistant lecturers of the Bolyai Institute at the University of Szeged started developing WebMathematics Interactive website that year, which was essentially the previous version of **WMI2**. Many helpers and co-workers joined the development of the program. From 2006, *Partíció BT.*, a company in Szeged has taken the development; one main speciality of this company is the management of mathematical software.

The website **matek.hu**, which contains an installation of **WMI2**, is freely available for everyone. Most of the underlying software are free software, **WMI2** itself is so.

Between **WMI2** and **WMI1** many similarities are there, but we have rewritten the 2nd version from the basics. Most of this work was done by our colleague, Árpád Fekete, partially under his work for thesis. For the graphical works, we thank *Zsigmond Kovács* and *Zsuzsa Deák*, and the artists of the *Gnome* desktop environment.

It would be long to enumerate that who assisted to the completion of this program in a smaller or bigger portion. But we still try it: we believe that a quality software can be made only by cooperation. **WMI2** is the result of such a joint work.

4.1. ACKNOWLEDGEMENT

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4.2. CONTACTS

The [matek.hu](http://www.matek.hu) website is maintained by Partíció BT. You can contact us at <http://www.particio.com>. We are accessible by email at the info@matek.hu address, by mobile phone on +36-706226977.