

# $\int$ ractical Calculus & $\int$ Applied Analysis

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**WOLFRAM ALPHA – Computational Knowledge Engine**  
*<http://www.wolframalpha.com/>*

**Letter by Oleg Marichev**

Dear colleagues, I am sending information, that can be interesting to everybody and can help in our work and life.

Go to Google and type the two words "Wolfram Alpha".

You will find that in May 2009 our company makes available new product: a kind of "answering machine". We found ways how to evaluate answers on users questions.

Below I give two links: – one about Alpha; – the other about more than 300 000 formulas at functions site; – by the way, there you can find the largest at the world collection of symbolical and fractional derivatives:

*<http://blog.wolfram.com/2009/03/05/wolframalpha-is-coming/>*

*<http://blog.wolfram.com/2008/05/06/two-hundred-thousand-new-formulas-on-the-web/>*

With best regards,

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*May 4, 2009*

## Wolfram Alpha: From Wikipedia, the free encyclopedia ([http://en.wikipedia.org/wiki/Wolfram\\_Alpha](http://en.wikipedia.org/wiki/Wolfram_Alpha))



|                       |  |
|-----------------------|--|
| <b>URL</b>            | <a href="http://www.wolframalpha.com">www.wolframalpha.com</a> |
| <b>Commercial?</b>    | Yes  |
| <b>Type of site</b>   | <a href="#">answer engine</a>                                  |
| <b>Owner</b>          | Wolfram Alpha LLC  |
| <b>Created by</b>     | <a href="#">Wolfram Research</a>                               |
| <b>Launched</b>       | May 18, 2009 (official launch)<br>May 15, 2009 (public launch) |
| <b>Current status</b> | Active   |

**Wolfram Alpha** (also written as **WolframAlpha** and **Wolfram|Alpha**) is an [answer engine](#) developed by [Wolfram Research](#). It is an online service that answers factual queries directly by computing the answer from structured data, rather than providing a list of documents or web pages that might contain the answer as a [search engine](#) might. It was announced in March 2009 by [Stephen Wolfram](#), and was released to the public on May 15, 2009.

**Overview:** Users submit queries and computation requests via a text field. Wolfram Alpha then computes and infers answers and relevant visualizations from a core [knowledge base](#) of [curated](#), [structured data](#). Alpha thus differs from [semantic search](#) engines, which index a large number of answers and then try to match the question to one. In this way it has many parallels with [Cyc](#), a project aimed since the 1980s at developing a common-sense inference engine. Wolfram Alpha is built on Wolfram's earlier flagship product, *Mathematica*, which encompasses computer algebra, symbolic and numerical computation, visualization, and statistics capabilities. With *Mathematica* running in the background, it is suited to answer mathematical questions. The answer usually presents a human-readable solution

**For example:**

- $\lim_{x \rightarrow 0} x/\sin x$  yields the expected result, 1, a plot, and the series expansion. The button "show steps" provides a possible derivation of the result using [L'Hôpital's rule](#).

- $\lim_{x \rightarrow \infty} \sin x / \cos x$  is correctly interpreted as  $\lim_{x \rightarrow \infty} \frac{\sin x}{x \cos x}$ . The

answer given is 0 although in fact, the limit does not exist. (This can be seen by observing that the [limit superior](#) of the function is infinite, as

$$\sin\left(\frac{\pi}{2} + 2\pi n\right) = 1, \quad \cos\left(\frac{\pi}{2} + 2\pi n\right) = 0 \quad \text{for all } n \in \mathbb{N}, \quad \text{but that } \lim_{n \rightarrow \infty} \frac{\sin \pi n}{\pi n \cos \pi n} = 0.$$

However, Wolfram Alpha is also capable of responding to natural-language fact-based questions such as "Where was [Mary Robinson](#) born?" or more complex questions such as "How old was [Queen Elizabeth II](#) in 1974?" It displays its "Input interpretation" of such a question, using standardized phrases. E.g., "Mary Robinson | place of birth" or "age | of Queen Elizabeth II (royalty) | in 1974". It is also capable of performing calculations on data using more than one source. For example, "What is the [fifty-second smallest](#) country by [GDP per capita](#)?" yields [India](#), \$725.76 per year.

The database currently includes hundreds of datasets, including *All Current and Historical Weather*. The datasets have been accumulated over approximately two years, and will continue to grow. The range of questions that can be answered will grow with the expansion of the datasets.

**Technology:** Wolfram Alpha is written in 5 million lines of *Mathematica* (using [webMathematica](#) and [gridMathematica](#)) code and runs on 10,000 CPUs (though the number is upgraded for the launch).

**System Requirements:** Wolfram Alpha requires an up-to-date web browser. [Internet Explorer 7](#), [Mozilla Firefox 3](#), [Safari 3](#), [Google Chrome](#) and [Opera 9](#), along with all subsequent releases of these browsers, are compatible with the website. On older browsers, it does not display text correctly and renders a message that states: *Sorry ... Wolfram|Alpha requires a more up-to-date web browser...* on its home page.