

A Different Pencil Too Good to be Ignored?

A First Look at Wolfram|Alpha

By Gizem Karaali and Bruce Yoshiwara

So you came across several news pieces about Wolfram|Alpha and you're wondering what all the fuss is about. Let's start with the basics. Wolfram|Alpha lives at <http://www.wolframalpha.com>. It defines itself as 'a computational knowledge engine.' It's a couple of months old (it will give you an exact answer in months and days, and convert that into hours, seconds, weeks and years). Its source code, in *Mathematica*, runs at about five million lines. It uses a constantly growing internal knowledge base. Its mission statement is ambitious:

"Wolfram|Alpha's long-term goal is to make all systematic knowledge immediately computable and accessible to everyone. We aim to collect and curate all objective data; implement every known model, method, and algorithm; and make it possible to compute whatever can be computed about anything. Our goal is to build on the achievements of science and other systematizations of knowledge to provide a single source that can be relied on by everyone for definitive answers to factual queries."

If that didn't pique your interest, there is more: Wolfram|Alpha works on any browser, requires no plug-ins, and outputs are easily shared. It's free, it requires no knowledge of *Mathematica* syntax, and your students are already using it.

Try for yourself. On the Wolfram|Alpha home page, in the query box under the logo, just type 'line (1, 3) (4, 9)'. You'll get a graph, two versions of the equation of the line, the intercepts, the slope, and the distance between the points. ' $x^2 \sin x$ ' gives two graphs, many alternate forms, roots, extrema, and both derivative and anti-derivative — with the option of showing intermediate steps! 'Plot $\sin x \cos y$ ' yields both a contour diagram and a 3D plot. Type in 'sum $1/n^2$ ' to see the sum of the infinite series, that both the ratio and root test are inconclusive, but that the integral test shows that the series converges.

Wolfram|Alpha isn't simply *Mathematica* online. It also knows how many calories there are in a Big Mac (510), how far apart Paris is from London (213 miles), when Albert Einstein was born (March 14, 1879) and exactly how long ago that was

(47593 days from the writing of this sentence). The query 'What is the meaning of life?' returns the input interpretation 'answer to life, the universe, and everything' and the answer '42 (according to Douglas Adams' humorous science fiction novel *The Hitchhiker's Guide to the Galaxy*)'. To see more, select the Examples tab at the top of the page. You'll find many different topics (Math, Places & Geography, People & History, Food & Nutrition, Sports & Games...) with several examples in each.

Of course, Wolfram|Alpha has its limitations. It has gaps in its knowledge. According to its FAQ page, it 'can only know things that are known, and are somehow public. It only deals with facts, not opinions.' It can misinterpret your query. Its response may be inappropriate for your purposes.

But why should you care? Wolfram|Alpha is simply fun to play with, but its sheer power and reach will also have an impact for the mathematics classroom. Your colleague teaching the course prerequisite to yours is using it, your students will notice it answers many homework questions, and most people appreciate having a CAS available from any device connected to the Web.

Once again a new technology raises questions about how we run our classes, how we plan our curricula and how we use tools to enhance learning. The conversation has already begun. You can contribute at the Wolfram|Alpha wiki at <http://walphawiki.wiki-dot.com/>.

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