Geogebra Testing Notes

1. Context

- Time — 5 hours but you could spend weeks or months.
- Resources — Just me.
- Risks — N/A
- Constraints — No time to read the Help files, release notes etc or even to explore all the features.
- Objectives — Find 4 or 5 interesting bugs. Don't care about test coverage.
- Application size — Large
- Application complexity — High – it's version 5
- Domain knowledge — Very little.
- Application knowledge — No previous knowledge

2. Inventory

What are the sort of things we could test?

- Installation / uninstallation / platform compatibility / resource requirements / upgrade from previous version
- Calculation accuracy
- Appearance and interaction
- Versions (desktop, tablet etc)
- Export as File
- Share as GeogabraTube / playback in browser (as HTML5 or Java applet)
- Scripting
- Create Tools
- Lots, lots more.

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3. Approach

- Decided to look at the accuracy, in particular rounding errors and how infinite results are handled - these are usually sources of errors in any application. This revealed Issue #1.
- Played with exponents, not with any expectation of finding problems, but found Issue #2.
- I also decided to look at the interactions such as zooming and dragging the trace, adding, moving and removing sliders.
- Did some basic tests with character set support in variable names. Chinese was supported so I assume there is full Unicode support.

4. Tests

Angular functions

- Played with sin, cos and tan - they all behaved ok at first but large values for tan(x) are not – the peaks should go to infinity but they go to random values depending on the zoom level. See Issue #1.
- It seems that the application knows a lot of relationships such as sin^2(x) + cos^2(x)=1, so when you create this function it just gives you the answer (y=1). **But now it does not do it!**
- It also knows how to integrate sec(x). Wow! How does it do that???
- Shared the Integral of sec(x) as GeogabraTube and viewed in a browser. Worked ok.

Special numbers

- Tested what happens if 'special' numbers are used in formulae, such as 'e' and 'i'. Are they treated as 'special' numbers or as variables?
    - 'e' is treated as Euler's number (approximately 2.718281828).
    - 'i' is treated as the square root of -1.
- What happens if these letters are used as variable names? See Issue #5.

Appearance

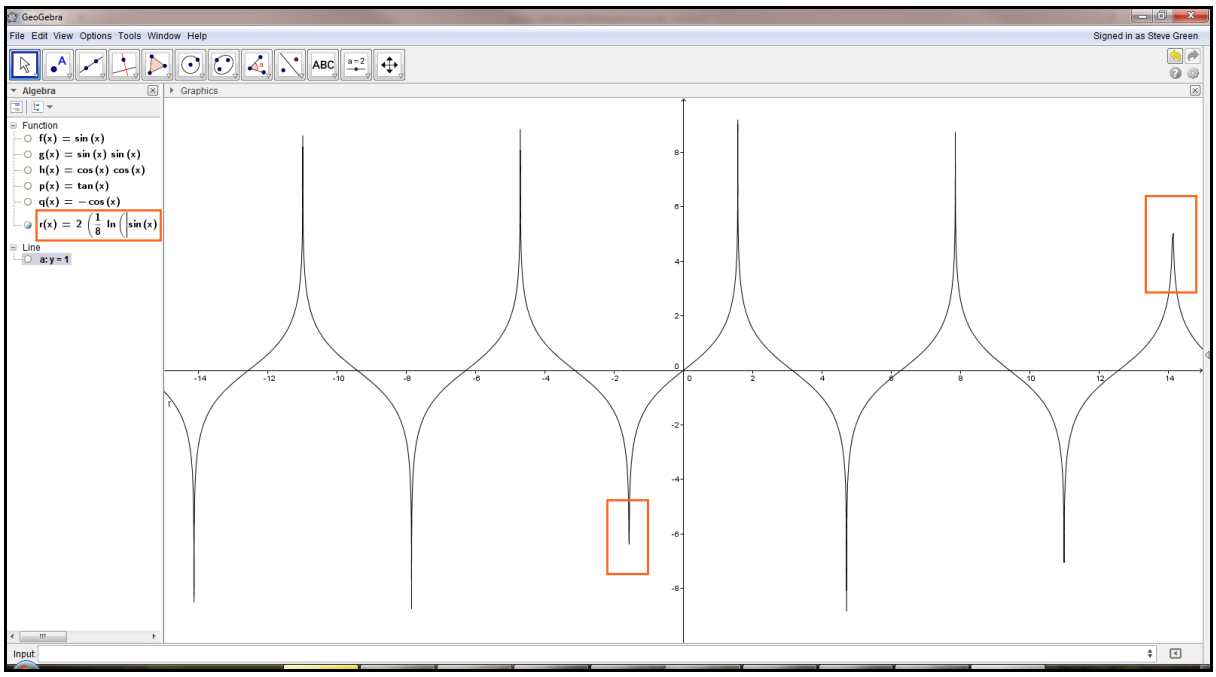
- Added every single-letter variable. This added 21 sliders (there are 5 'special' letters - e, i, x, y, z). They were all overlaid on each other. See Issue #4.

- Zooming with Trace on – see Issue #6.

5. Issues

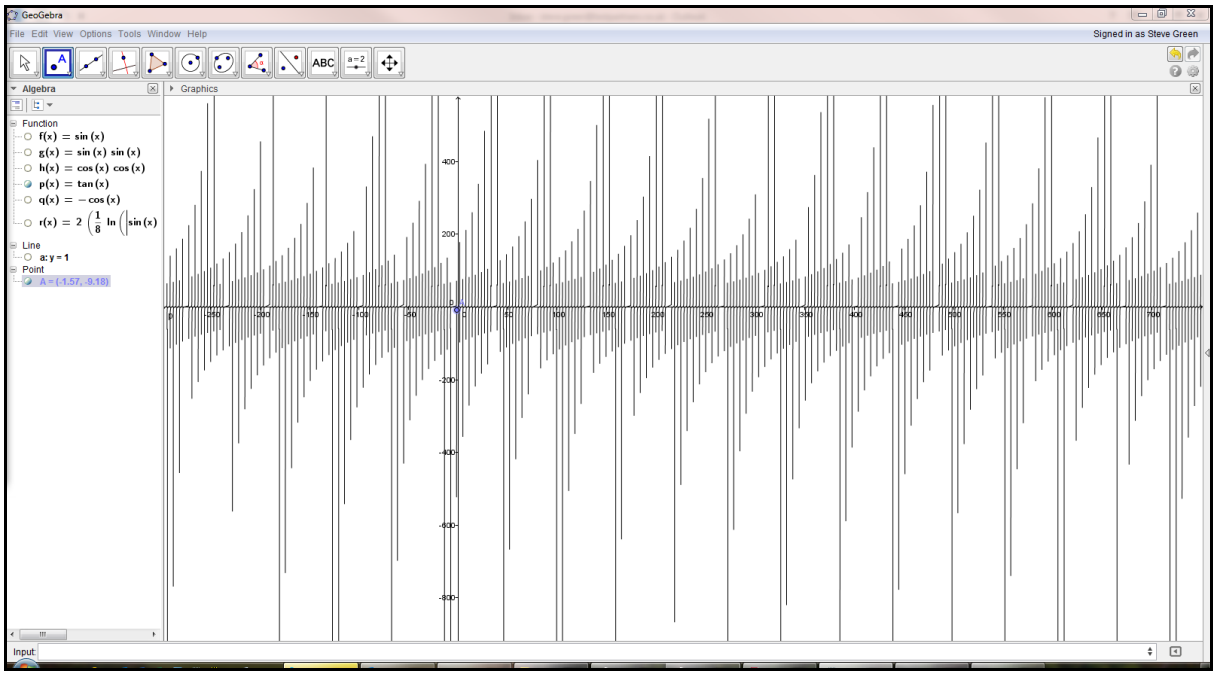
Issue 1

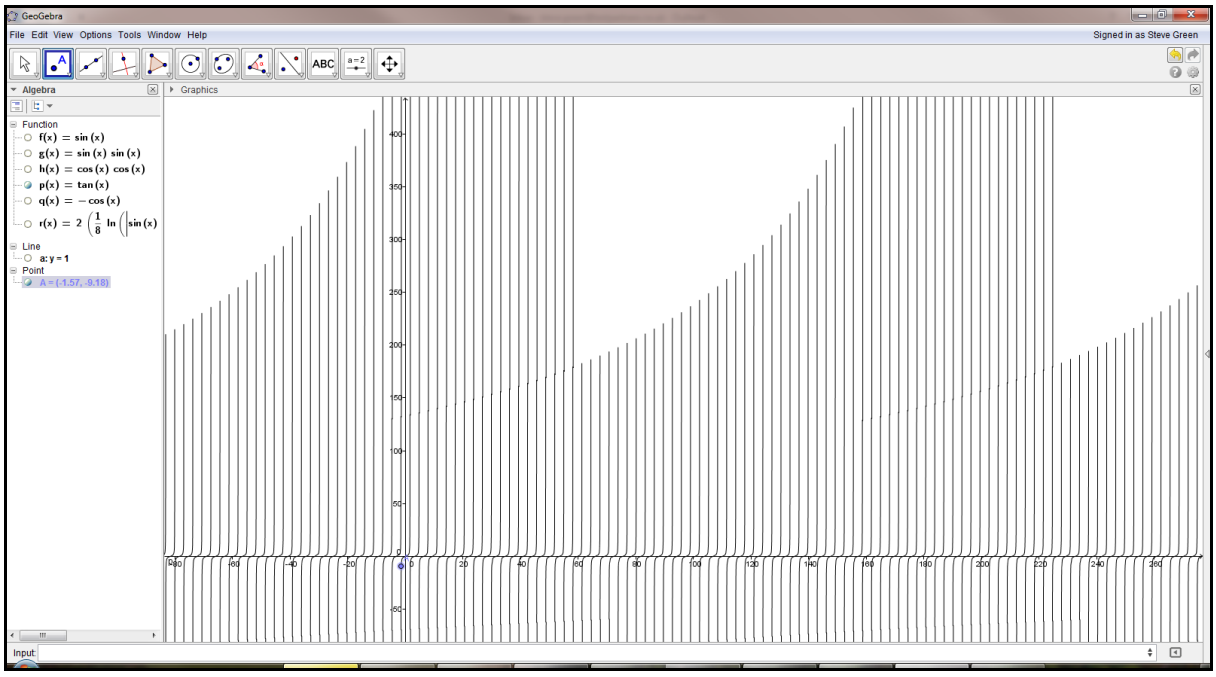
The output for y = Integral [sec(x)] should be a repeating pattern but the peaks are all different heights. See screenshot.



The height of any given peak varies massively as the zoom level changes. It's best to demo this rather than use screenshots.

This contrasts with y=tan(x), where the peaks do all look like they go to infinity. But in fact they don't - you get some interesting patterns when you zoom out. See screenshot.

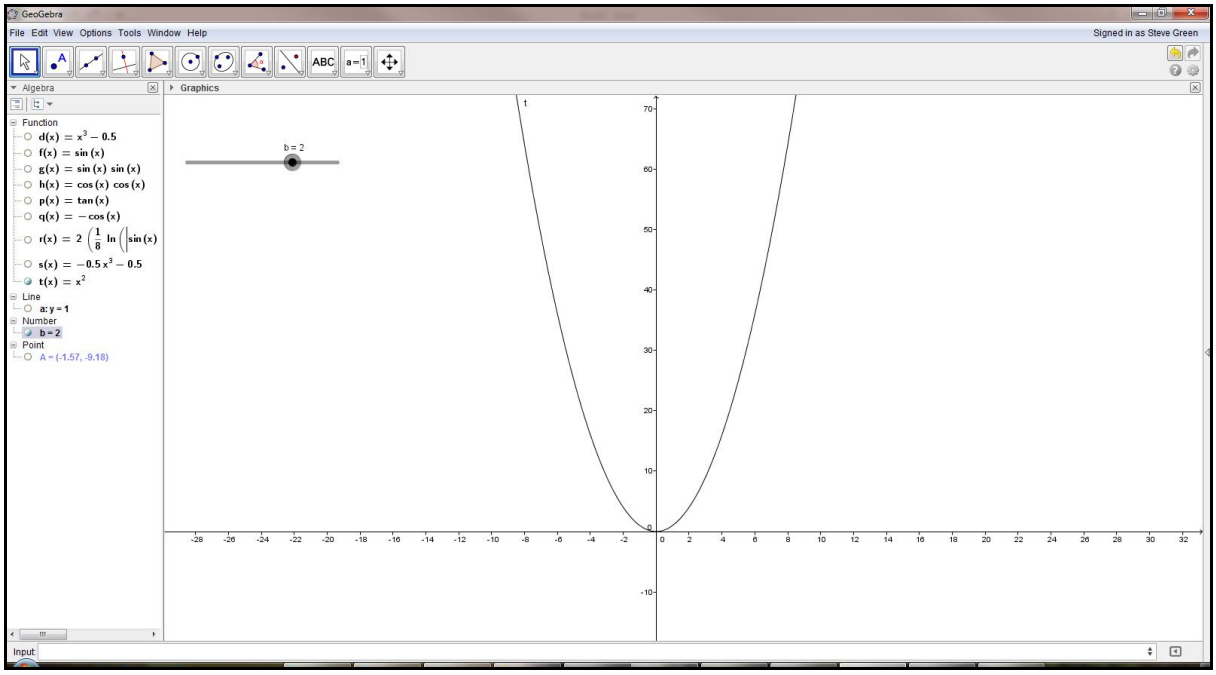


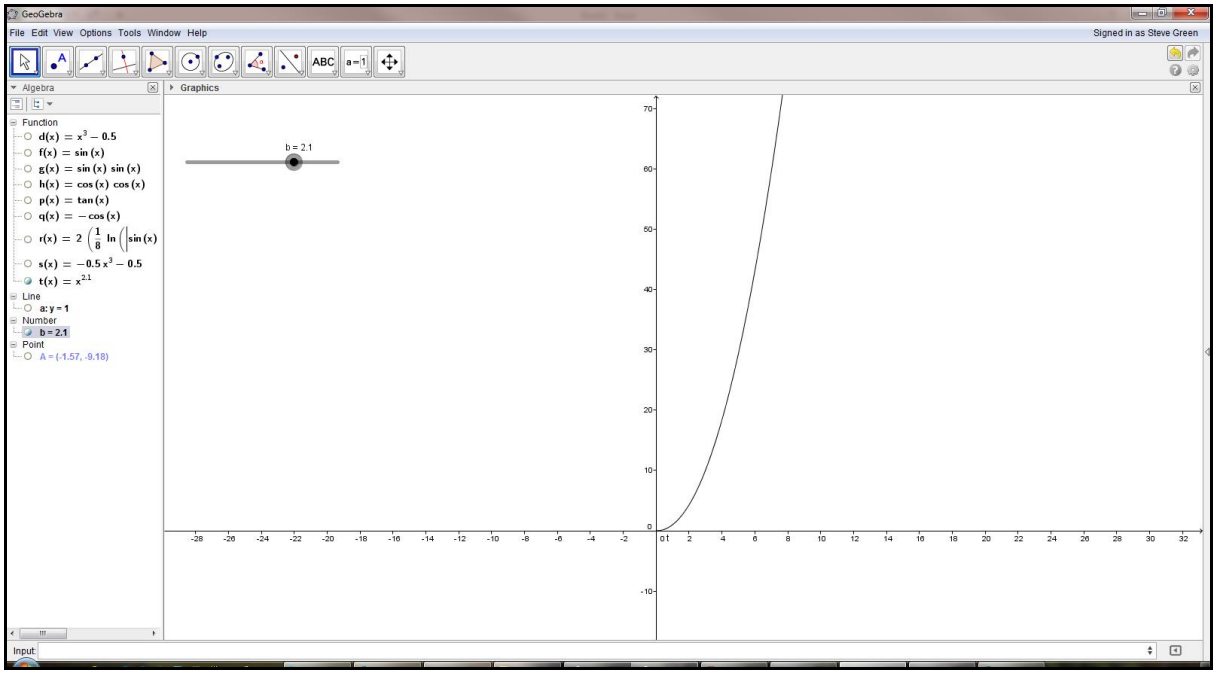


Another example is $y=\sin(x)^2*x^3$. The trace varies wildly when you zoom. It even varies when you drag the trace at a fixed zoom level.

Issue 2

For exponential functions, values for y are only displayed for negative values of x if the exponent is an integer. See screenshots. On reflection this is to be expected because non-integer exponents result in y being an imaginary number. However, nothing is displayed to indicate that this is the case.



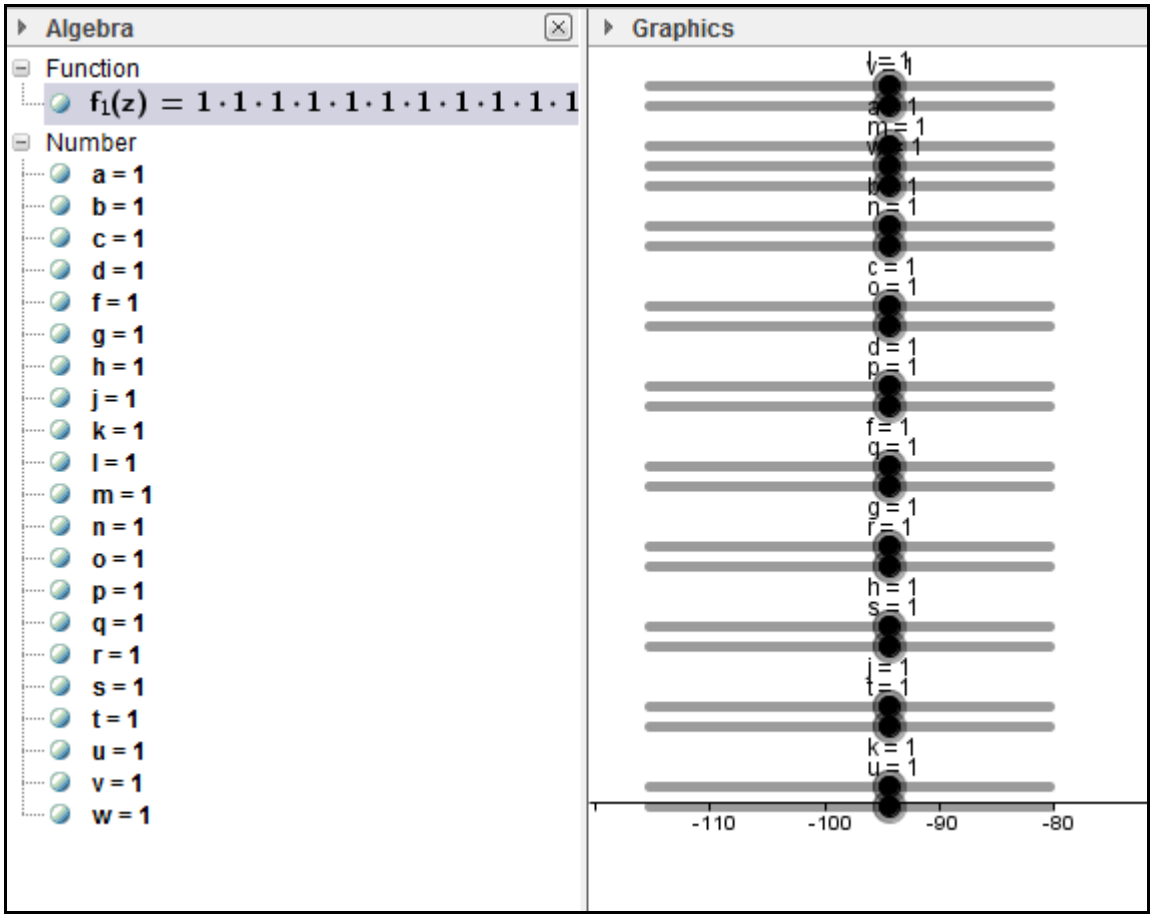


Issue 3

Sometimes if the letter 'i' is included in a formula, nothing happens when it is submitted. The formula disappears from the Input field but does not appear in the Function list. There is no error message. This does not always happen though, and I can't figure out why.

Issue 4

If lots of sliders are added, they are positioned on top of each other. See screenshot.



Issue 5

The application automatically assigns 'e' and 'i' as variable names, in which case you can no longer enter them as 'special' numbers in new formulae. There are numerous other prohibited variable names (such as 'sin' and 'cos' etc) and these 'special' numbers should be prohibited too.

Issue 6

If Trace is turned on, all previous traces disappear when the zoom level is changed.