LET THEM LEAVE THEIR CELL PHONES ON!

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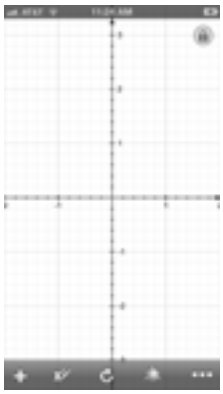
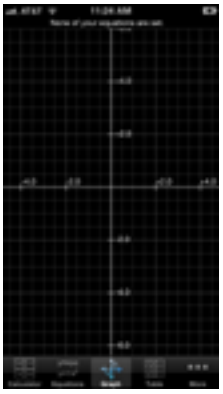
It may seem odd to anyone reading this, and I guarantee those in attendance thought to themselves "*what in the world could be the point?*" because one common theme among most teachers is "*how in the world can we get them to turn those darn things off?*" and not encourage the students to keep them on. Directly after my introduction, I played a clip from the movie "*The Devil Wears Prada*" in which the newly hired Andrea is in a discussion with her boss, says something pretty silly/ridiculous and her boss responds with "*...what, did you fall down and smack your little head into something?*". I then assured them there was a point and I had not "*fallen down and hit my head on something*". Of course, we want our students attention during class time but there are definitely very good reasons why we shouldn't mind (or even encourage) them to use their cell phones, and definitely one huge benefit (especially to those of us teaching math!) is the wealth of "*graphing calculator*" apps at their disposal. I will discuss a few of those options here, ending with what I feel is by far the best such application available!

The first of the apps I will mention is one of my favorite "*go to*" calculator apps, even before going to the basic one provided by Apple for the iPhone. It is named quite simply "*Graphing Calculator*" by Appcylon LLC. It has a very clean look, is convenient for simple calculations but a surprisingly powerful (yes easy to use) graphing tool:



There are many similar utilities available in the iOS world, so why focus on this one? Well, first of all it's free (but there are many others that are also free) but one nice feature, especially when using it in the classroom, is the easy graphing interface to plot multiple functions on a single graph in multiple colors:



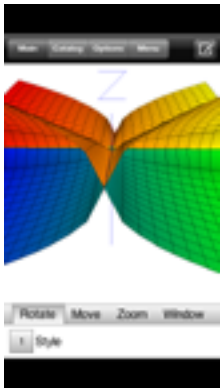
But even beyond that nice convenience, it also does something most graphing utilities can't do (even most handheld graphing utilities!)…and that is graph in multiple different forms: regular/explicit functions, implicit functions, parametric functions and functions in polar coordinates:

I'm sure some of these features are in many different apps, but having these all in one place and in an easy to use interface makes this a definite "*must have*". A few drawbacks are: the lack of more than four different graphs/colors at any given time (if you'd like to continue plotting, like in an expanding Taylor series example) you'd have to eliminate one of the first four in order to add a new one to the picture and the ability to do 3D function plotting.

The other app that I will highlight in this paper is the "*crème de la crème*" of graphing applications available on the iOS platform. But, it goes above and beyond that as I will attempt to illustrate. I have been in communication with the app's developer, a very nice person and very willing to accept/answer questions and always willing to hear ideas to improve the app.

The app was called "*SpaceTime*" but has since changed its name to "*MathStudio" by Pomegranate Apps. Of course, it has a wide variety of graphing types allowed as well as the ability to graph in 3D!!!*





As someone who teaches Calculus III on a fairly routine basis, I find the ease of use (especially for 3D plots) to be very handy…and for demonstration purposes, or for their use at home?, the ability to "*handle*" the 3D images and twist them about to view from any angle… there's almost no other way/platform they could do this in such a simple way! Imagine being able to "*look down a singularity of a graph so students can SEE the reason a limit fails to exist*" or to just look at a 3D plot from alost any angle to see why the answer for a limit problem "*as (x,y) -> (a,b)*" actually makes sense!

This alone might put the app right at, or near, the top of my graphing utility list, but perhaps not worth its $19.99 price tag. As they say in the used car business, "*but wait, there's more*"… so much more! In my opinion, this has all the functionality of say a TI-89 Titanium Edition… or even most of the use one would get out of a Mathematica program; making use of a device that so many of them already have! That's right, this is a fully functional CAS… computer algebra system. There are so many uses, I can't possibly name them all here without having a 20+ page paper. But some of the many, many features of this easy to use CAS (with built-in examples…so if you're not quite sure how to enter what you need, you can view an example that is sure to help) are: derivatives, integrals (both definite AND indefinite!), limits, various types of differential equations… and many, many more:



While these are just but two of the many, many examples available for use on an iPhone in the AppStore, I hope you can see how powerful these devices are and how incredibly useful the apps being developed have become. In the future, even if your attitudes toward these devices had been different in times past, I hope you will consider within your classes "*Let Them Leave Their Cell Phones On!*".