Creating Tactile Graphs with the Desmos Graphing Calculator
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Introduction

Desmos (desmos.com) has an excellent free set of web math tools including a graphing calculator. There are a number of ways to create tactile graphics with this calculator, though most do not create acceptable braille labels presently.

I will discuss several ways to create tactile graphs and will point out how ongoing developments by both Desmos and ViewPlus could make it possible to make really excellent braille-labeled tactile graphics with the Desmos calculator.

- All these methods begin by creating an equation and specifying parameters such as the max and min of x and y, and whether to show grid lines, etc.
- The graphing calculator allows you to define an arbitrarily long list of equations. We will use only the first one. Begin by typing an equation into the first position. My favorite test function is y=x*sin(x)
- Open graph settings and set your desired graph parameters. Do not show minor grid lines - they overwhelm the graph. You do not need to select the braille option at this time unless you want to compose or edit in braille.

Special procedure to emboss tactile graphics with braille labels

Several years ago, Desmos devised a special procedure for making braille labeled tactile graphics with the popular ViewPlus Tiger Max embosser as well as Index embossers. Unfortunately this procedure was custom-designed and is not really extensible to other, newer ViewPlus embossers. The graphics print just fine on all ViewPlus embossers but the labels, well not so much.

I applaud their commitment to accessibility but sure wish they had done this in a different (and actually quite a bit simpler) way that is extensible to other models. I believe that future work by Desmos and ViewPlus will result in a number of ways to create really excellent tactile graphics with good braille labels.

If you do have a Tiger Max embosser, then this special method still works, and you can make really good braille-labeled tactile graphics. Instructions are given by Desmos and I will summarize briefly.
- Start by creating an equation as described above.
- Press ALT+CTRL+s to open a set of options. Select "export image".
- Now select the format either braille Nemeth or braille UEB
- Select size, which interestingly is also the embosser selection. You may choose the Tiger Max or an Index embosser and either letter size or 11.5x11 inch paper.
- Download a PNG, and find the PNG in the downloads file using Windows explorer.
- Right click or press the context keyboard key (if there is one)or press CTRL-f12 to bring up the context menu for that PNG.
- *Select 'print' on the context menu. You mayh need to go to "additional options" to find 'print'.

- That printer dialog is not standard and may not have your Tiger Max listed. You can add it most easily by listing the printer ports and finding the Max, which is attached to a USB port.
- The dialog gives a number of options, most of which you do not want, but some (like the orientation option) could be useful.
- *Now print. You should get a nice graph with whichever labels you have selected appearing in well-formed braille.
- If you use another ViewPlus printer, the graphics should be the same but the labels will probably not be well-formed braille.

Direct print

- After creating the equation and setting parameters as described above, you can just print to any Windows printer, including any ViewPlus embosser.
- *Unfortunately you have relatively few parameters that are controllable. You cannot change any font property, you cannot even set as portrait or landscape. If your Tiger tab setting is to not print standard text, there will be nothing embossed.
- If you do not need a labeled graph but only a "quick and dirty" example, this might be good enough. However there is a better choice that is only marginally more effort than direct print.

Printing an SVG file

- *The 'Export Image' option used to export the Tiger Max braille file also has an option to export an SVG file.
- *Do this by pressing ALT+CTRL+s after defining the graph and selecting SVG as the format option. Set remaining parameter choices available for SVG and download that file.
- *This SVG option gives you access to several more parameters than you have with direct printing including graph dimensions and orientation. It is easy to open the SVG in any standard web browser and print a nice file that can fill the letter or 11.5 x11 page.
- It does not provide an option to set font properties, but you can make some limited changes by simply editing the SVG file in a text editor first.
- *All fonts originally are Arial and the point size is 12. Possibly the best result at the present time would be to search and replace the words 'font-size="12' by 'font-size="36'.
- It does not provide an option to set font properties, but you can make some limited changes by simply editing the SVG file in a text editor first.
- *All fonts originally are Arial and the point size is 12. Possibly the best result at the present time would be to emboss the regular characters after enlarging them enough to be readable tactually.
- So search and replace the words 'font-size="12' by 'font-size="36'.
- Now go to the printer properties Tiger tab of your ViewPlus embosser and set it to emboss standard text. The labels will now be embossed standard characters at 36 point size. This is large enough that most blind people can read it with their fingers. If 36 turns out to be too small, increase it.
- *You can also try setting the font-family to Braille 29 or some other US/UK braille font that shows dots on screen. By experimenting with the point size you can eventually find one that gives the right size character to be braille. This is not really the right way to emboss braille, but web browsers do not have printer drivers sophisticated enough to

communicate with the printer as do other software apps. ViewPlus is writing a more adequate SVG print routine for web browsers that will eventually permit SVG to be embossed so that the text characters can be excellent braille.

Conclusion

Presently there is no perfect solution for Desmos to create perfect tactile graphics with correct braille labels. But when web browsers become capable of handling fonts properly, Desmos SVG exports will be excellent for creating files that print excellent tactile graphics.