

Sparking the interest of math among high school students

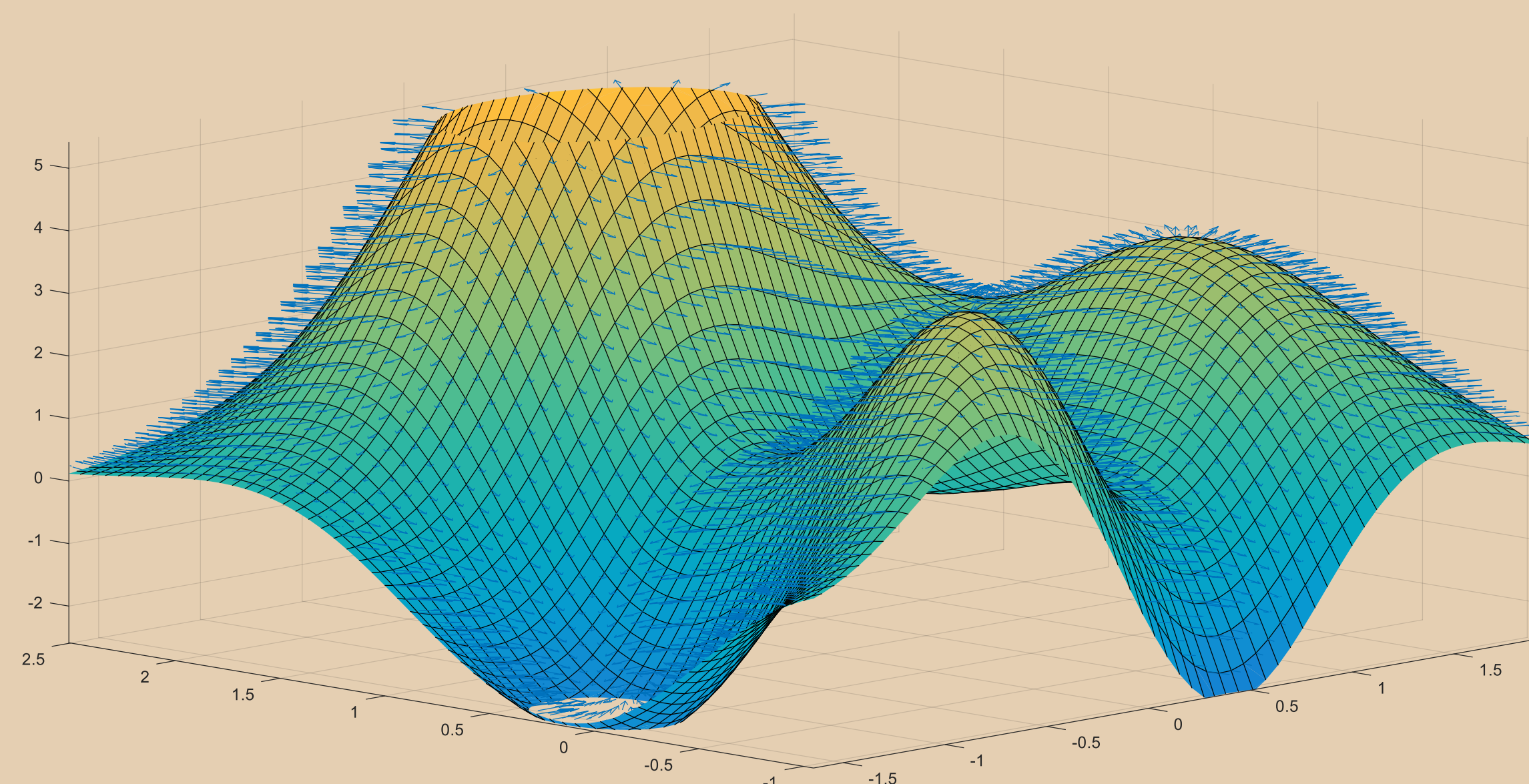
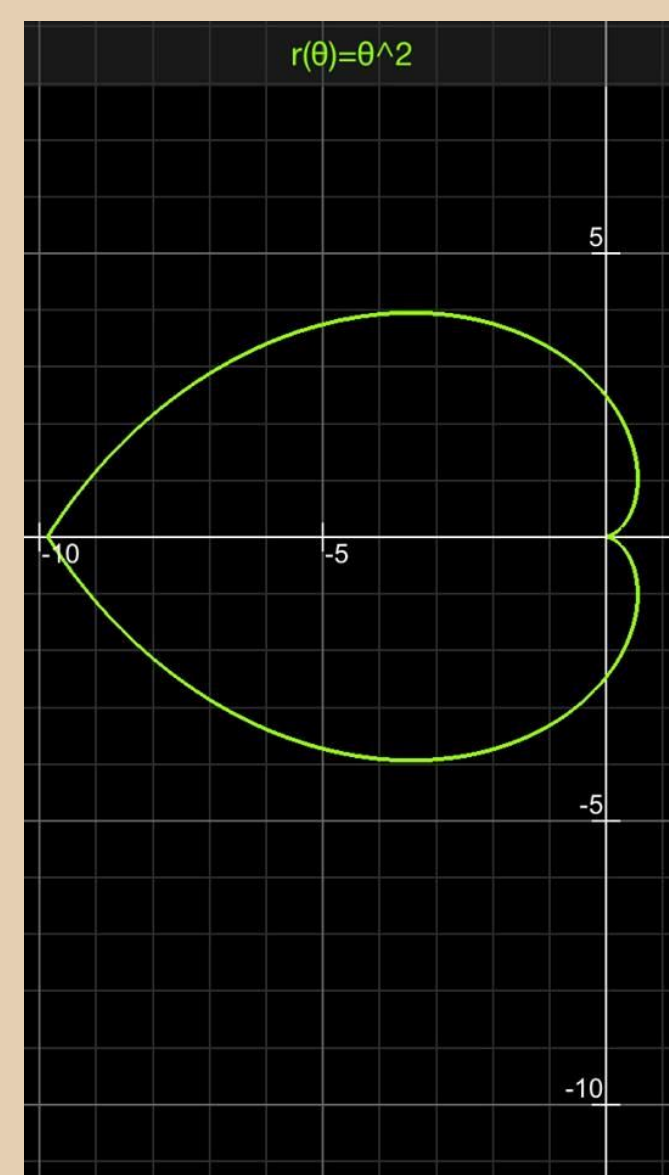
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STRATEGY

Based on experience with students, most of them are put off by math because it sounds useless, abstract, and not cool. Because of the overwhelming complexity of the education system, we concluded that the best setup would be a form of parallel education where students can explore math in a fun and interactive environment. Therefore, we founded an educational initiative to promote for math and try to change such a perception. In this we had a motto that says, “math is not your life bug; it’s the universe most buc” where buc is an acronym for beautiful, useful and cool. In the following sections we reflect on each aspect and how we implemented our solutions. It’s worth mentioning that they are overlapping in some areas.

Beautiful

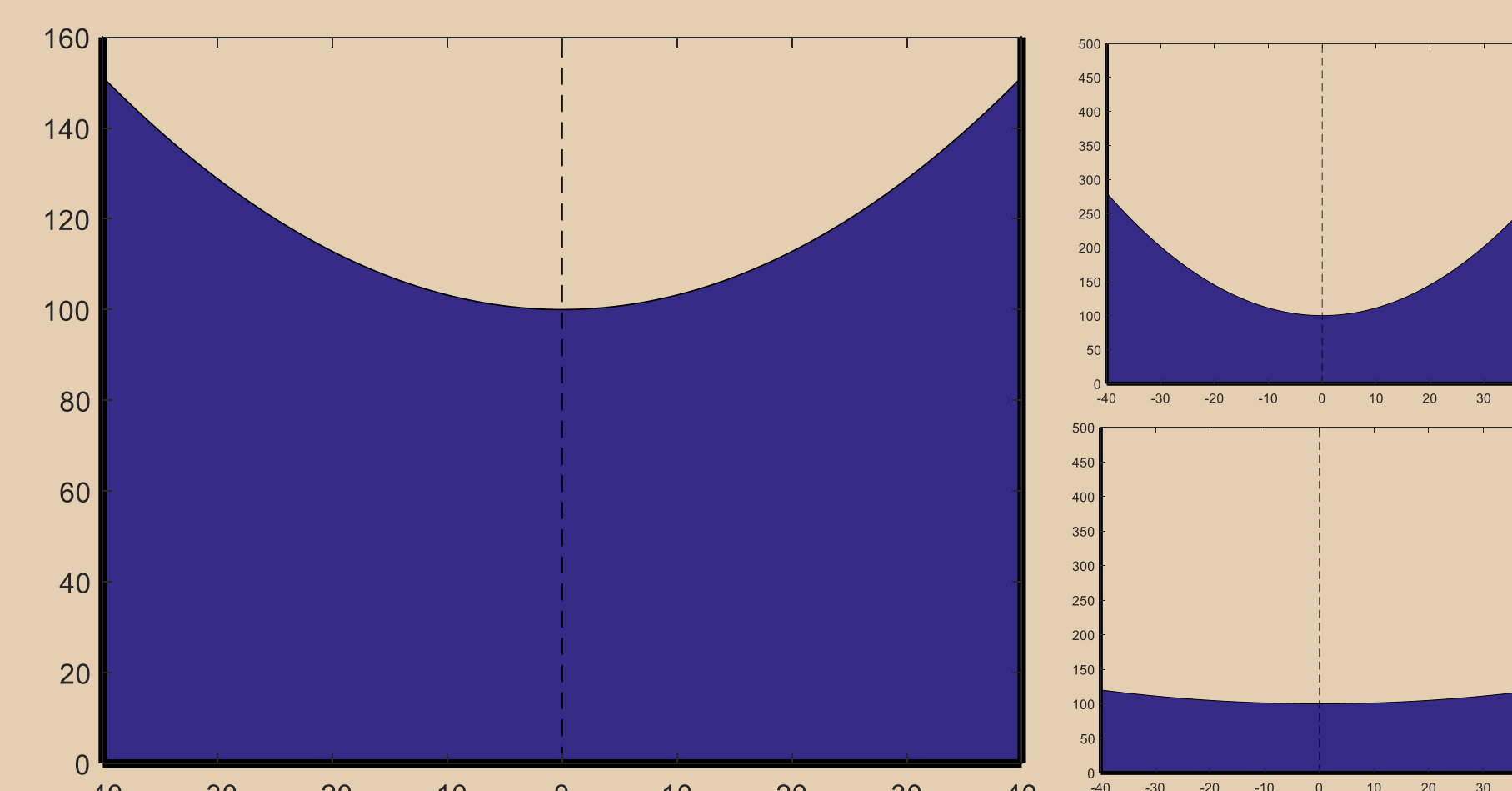
Due to the abstract nature of math, many students find it challenging to grasp many concept in mathematics. We utilize the use of technical computations software to reveal the beauty of mathematics by visualizing such ideas, like the gradient of a surface for example. Using mobile apps is also a great asset. A good example is plotting an equation in polar coordinates.



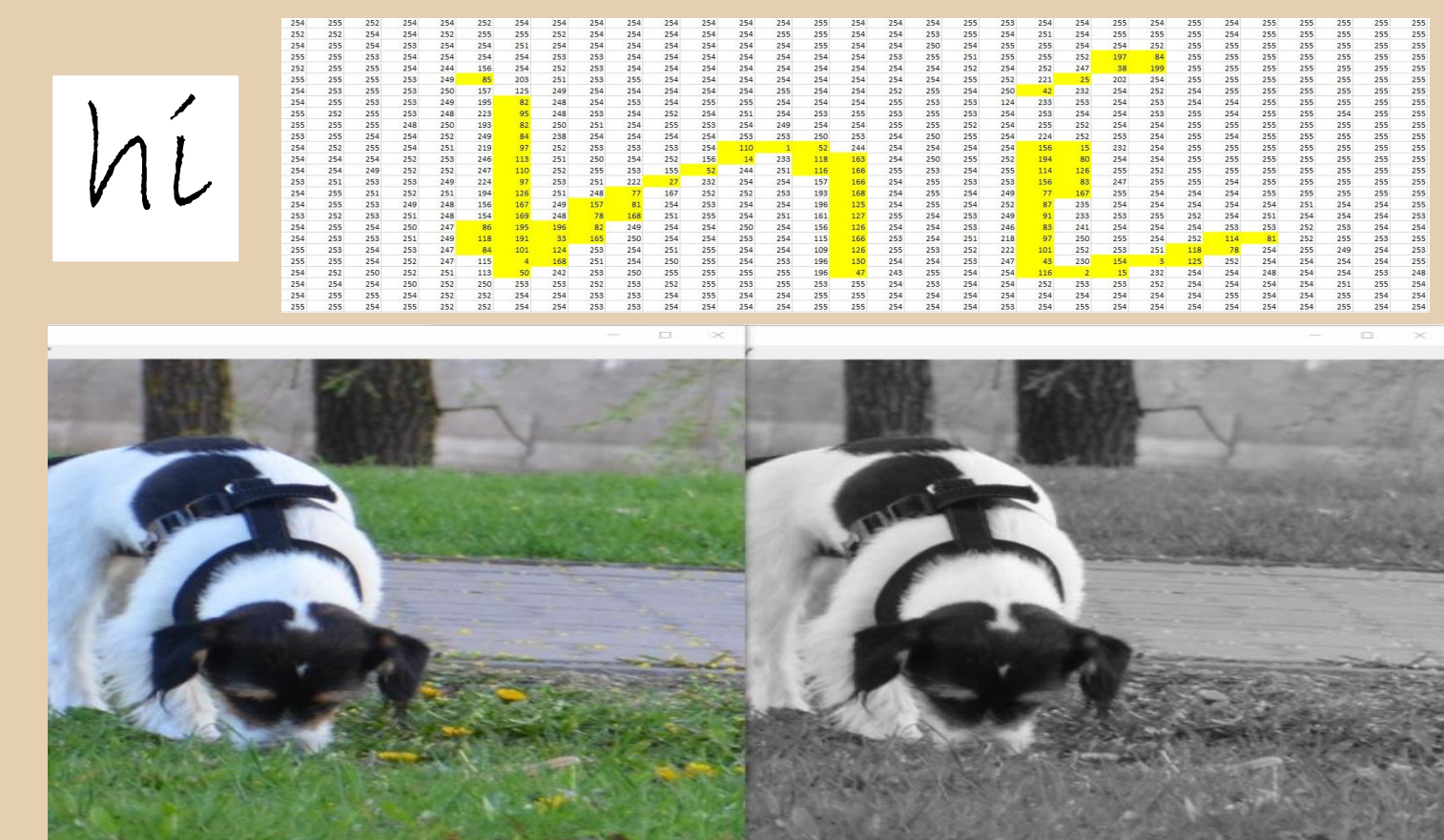
Math visualization examples. Using GoodGrapher mobile app to plot $r(\theta) = \theta^2$ (on the left) and MATLAB to plot surface norms (on the right)

Useful

Despite the fact that many curricula already include discussions of applications of mathematics, students still can’t develop a sensation of such applications, either because they don’t work on such applications themselves or they don’t find it in their everyday life. So, we try to relate math concepts with some engineering and technological applications. This can include for instance the illustration of matrix algebra with the aid of image processing functions. Another beautiful example is the description of fluid surface in rotating tank or fluid pressure distribution over an inclined surface and its related applications.



Using MATLAB to plot a rotating fluid surface shape which follows from the equation, $z(r) = \frac{\omega^2 r^2}{2g} + c$ (left) and the effect of changing ω (top and bottom on the right). It’s a good way to illustrate the use of integration, plotting parabola and effect of changes of coefficients



Expressing an image as a matrix and marking values below a certain threshold for black with yellow clearly shows how images are treated digitally for further processing (top). Converting a color image to gray scale is a matrix algebra operation (bottom)

Cool

Being interested in math unfortunately means for many students being weird and nerd among their friends. So we try to add some fun stuff for students. This could be printing some math comics on T-shirts or famous mathematicians which actually can be of great impact if carefully chosen.



Examples for math T-shirts. On the right, some cool combination and on the left a T-shirt for Hypatia, the first female mathematician with known works in history. Hypatia T-shirt is very good motivation for girls to pursue career in math and/or science especially when they know she lived in Egypt.