

Intro to Mathematical Eros¹

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There aren't a lot of other Pure Mathematics majors in this world. That's a shame, because math is a beautiful thing, and the problem is that math is one of those fields that is difficult to appreciate from a distance. From afar, it can look complicated and mysterious, and one often needs to be immersed in mathematics in order to understand its beauty, not too dissimilar to taking a semester abroad to immerse oneself in the culture of, say, Sweden. When I talk here about "mathematics", I will usually be referring to pure mathematics, which includes such subjects as logic, topology, number theory, and group theory. While statistics and accounting have their uses and their own enthusiasts, I personally never had a taste for the applied and I also feel like it requires less apology than its esoteric cousin. Hardly anyone asks what is the point of taking probability, yet the question is common among frustrated students studying differential geometry or some other abstract subject.

So, what's the big deal with mathematics? Why are so many people as passionate about math as some people are about sports or collecting things? Why do people write books or articles and create YouTube videos about mathematics and preach their love for it? The questions "when am I going to use this?" or "what's the point?" are especially rampant in high schools, where the students don't have much say over the number or topic of math classes they take. I feel like this attitude asks the wrong question, and part of the problem is in how mathematics is taught. Asking what the point of *any* class is can lead one down an infinite spiral staircase of questioning, if one tries hard enough. The questioning only ever stops at an arbitrary end point.

"What's the point of calculus?"

"To learn how to take derivatives and integrals."

"Why do I need to learn how to do that?"

"To calculate rates of change."

"How is that useful?"

"So you can predict how quickly diseases will spread."

To some, this seems like an intuitive stopping point, but to me, it feels awkward. Instead, I look at math as an artistic endeavor. No one asks of art classes why they should exist or what practical benefit there is to taking a music class, because we usually have some sense of "art for art's sake". I believe very strongly in math for math's sake.

The applications of learning math are numerous, to be sure. Time has shown us that a great deal of mathematics once thought esoteric later became useful. Trigonometry, at first glance, has something strange to do with circles and angles and numbers with decimal places that never

¹ For a longer discussion on eros in math, read Paul Lockhart's "A Mathematician's Lament".

terminate and arcane rules such as “soh cah toa” and it’s all a confusing mess for a lot of high schoolers who hope to pass the class with a C and never look back. They may not realize that trigonometry is essential for such things as GPS or navigating a plane (an airplane; navigating a Cartesian plane is another matter altogether). This is a tale told many times: matrix algebra becomes useful for computer science, number theory for cryptography, topology for astronomy, etcetera. This pattern places upon mathematics the expectation that everything one learns in math must have an application to solve some major problem in the real world. However, that shouldn’t be the impetus for studying math any more than one should learn an instrument with the goal of becoming an audiologist.

When I started going to college and had to decide on a major, I settled on mathematics because I had influences in my life that encouraged recreational math. Math for math’s sake. Because of this, and not because of what I learned in high school trigonometry, I decided to further immerse myself in math culture. Upon taking more math classes in college, I realized that past the grade school level, professors often have a deep passion for their subject. Contrast this with grade school teachers, who are often educators by profession, and not mathematicians. Too often, the love of math becomes lost in translation. The care that went into creating such things as the quadratic formula, which is a beautiful shortcut for finding roots which is derived in an ingenious way, vanishes and becomes another rule to be memorized and applied when the problem on the test has something of the familiar pattern “ $ax^2 + bx + c$ ”. Without the eros, math becomes as dry as it appears to many on the outside, and people on the inside struggle to explain why they care so much.

The truly great math teachers are the ones who will stay after class and talk for hours about a subject completely unrelated to anything you’re learning in their class. The great mathematicians are the ones who will research a problem on their own time, not because they are paid, but because they can’t sleep until they have solved the problem. The great math students are the ones who want to *understand* a subject, not just know enough to do well on the tests. These are the ones who have the eros for math, and they are the gateway for more people to appreciate the art form that is math. If you are not among the initiated, if you are one of the ones on the outside wondering why some people are so crazy about this subject, ask the math lovers in your life to explain what math means to them. If you are in the know, then try and let your passion show in your everyday life and in the way you teach others math. Without the eros, people won’t be encouraged to look further and uncover the secrets of mathematics. It’s a difficult subject to break into, but once you do, it’s like being in love.

Yitzi Turniansky is a senior math major at Towson University, and will also be getting a computer science minor. Favorite math class? Linear algebra! Yitzi also really enjoys playing board games with friends and family.