Emily Riehl

Johns Hopkins University

Queer in math and queering math

C. Dwight Lahr Lecture Series

Plan

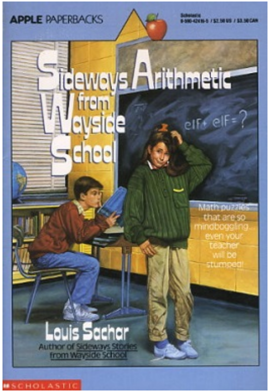
1. Queer in math

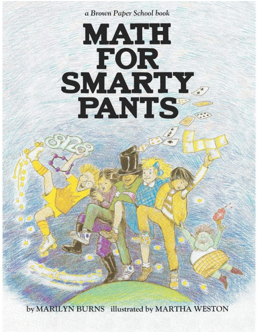
2. Queering math

1

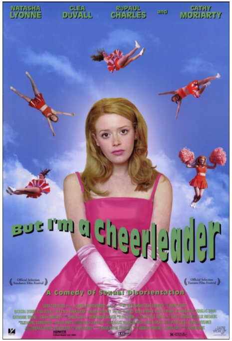
Queer in math

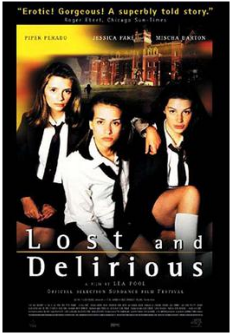
Queer math childhood





Queer in math in high school





On the intersections of polynomials and the Cayley–Bacharach theorem

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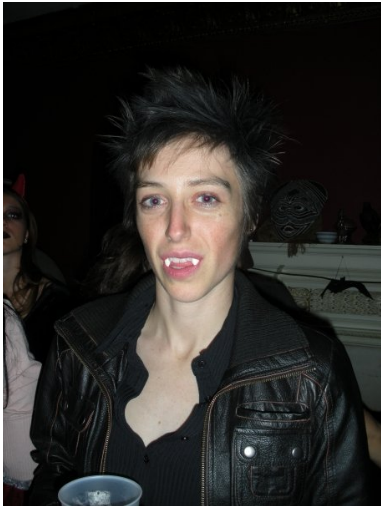
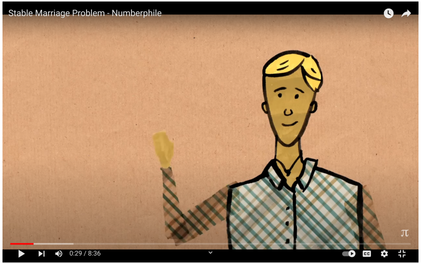
Queer in math in college

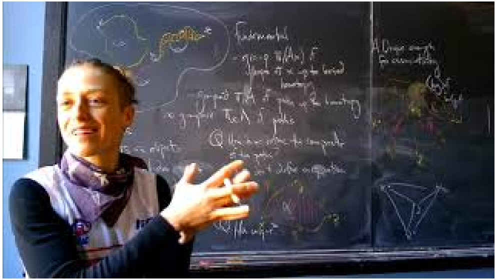
Queer in math grad school



Queer as a math postdoc



Queer as math faculty



On performing queerness in mathematics

In 2017, I interviewed Mike Hill for the American Mathematical Society's inclusion/exclusion blog.

> *ER: As you were developing a queer self-identity, was there any intersection between that and your mathematical identity?*
> *MH: No. It was one thing that was always a bit of an internal disconnect for me. When I was growing up the images that you would see of queer people were always like, what I think of now, as almost minstrel scenes. Like Jack in "Will and Grace." These are the role models that you'd have: things like fashion, dance, art. A lot of my concept of "Gay" came through things like literature. There isn't a whole lot of literature written about gay mathematicians or even someone in STEM. There are no movies like this.*
> *ER: Well there's the Turing film now.*
> *MH: It doesn't really end well for him.*

On performing queerness in mathematics

MH: It was so much so that when I was a first year in college I had trouble reconciling how to handle the fact that I was super interested in things like queer and feminist theory and also I knew I wanted to be a mathematician and I didn't know how to bide my time. All my friends in the queer community were taking all these gay and lesbian studies classes but I didn't really have time for that because I was taking an awful lot of math courses. I was wondering, should I try to do a dual major? Is this how one performs gay?
ER: Did this affect your experience in a mathematics classroom? Or were you focused on the math and not really embodied in that headspace?
MH: There's no external marking in queer identity: it's all performative marking. I never knew if any of the faculty who were teaching classes were LGBT. I never really knew about any of the other students. There was no space where that was really discussed. You talked about the theorems and you talked about confusions about the theorems. There was actually never discussions of personal life.

On performing queerness in mathematics

ER: Returning to something you said previously about queer identity being something that's not necessarily visible but that is performed, I remember very clearly when I first met you. It was at the Fields Institute in 2010. I was still in grad school. What I remember was that you were the first person I had seen performing queerness in a mathematics research context. You were dressed more or less like you are today.

MH: I'm wearing a t-shirt and jeans.

ER: Sure. Right. [laughter] You've described yourself as snarky. It was your affect, your way of speaking, and I thought it was the coolest thing I had ever seen, because it was something I had never seen before.

MH: Thank you.

ER: It struck me as so you. You were enlarging the space of what is possible in the performance that is the mathematics lecture. So, how did that happen?

On performing queerness in mathematics

MH: I guess like all things organically. Part of it is that I got less and less good at turning it off, at code switching between camping it up with friends vs giving lecture. When I first started teaching, I would try to be conscientious about using less inflected speech, having fewer wild shifts in intonation and less obvious queer markings in discourse. But then I just started to not worry as much.

By the point of Fields Institute 2010, I had my job at Virginia. I actually had tenure at Virginia. And I felt like I could deliberately choose to completely stop trying to worry. Thinking back to when I was a student, I didn't know a lot of queer mathematicians. Now I know many many queer mathematicians, many whom will say "I was never in." Okay. But it's not the kind of thing I knew starting out.

I wanted to start to push that envelope and force mathematicians who claim to be very liberal and progressive — and by and large are extremely liberal and progressive — to recognize that not everyone does math the same way. I think that translates into a lot of things. Not everyone performs math as the white cis het male. There are lots of other things.

Supporting queer students in math

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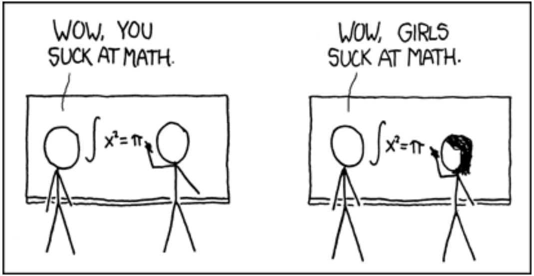

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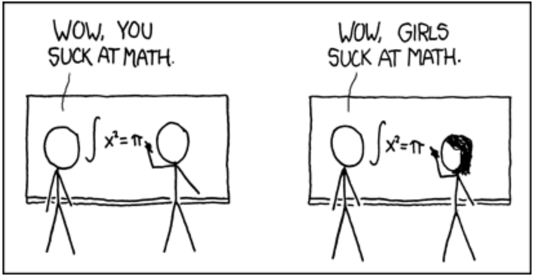

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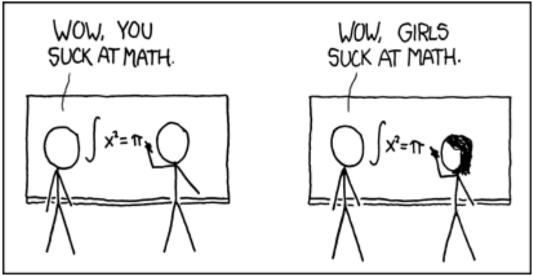

- Can you help make everyone feel more comfortable speaking up?
- Can you foster community and collaboration, beyond existing friend groups?

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- Learn and use students' preferred names and pronouns.
- Find out about the resources for queer students offered by university, which may offer awareness training for faculty members.

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- Advocate for policies that make it easy for mathematicians to change the name they use in professional settings.

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- Join the Outlist or Ally List hosted by https://lgbtmath.org/ or form and support a student chapter.

Spectra
The Association for LGBTQ+ Mathematicians

2

Queering math

The traditional view of equality

Reflexivity:
anything is equal to itself.

$$\forall x,\ x = x$$

Indiscernibility of Identicals:
if two things are equal, then they have exactly the same properties.

$$\forall x, y,\ (x = y) \to (\forall P, P(x) \leftrightarrow P(y))$$

Indiscernibility of identicals in action

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Thus the regular $2^5 \times 3 \times 5 \times 17 \times 257 \times 65537$-gon can be constructed by straightedge and compass.

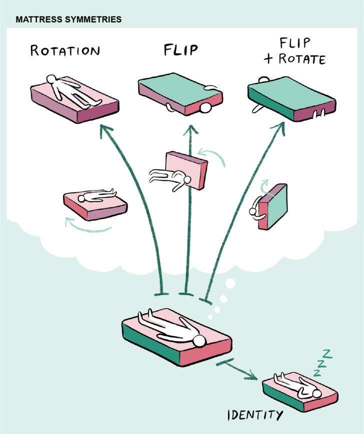
By the indiscernibility of identicals the same is true of the regular 137438953440-gon.

...la Mathématique est l'art de donner le même nom à des choses différentes.

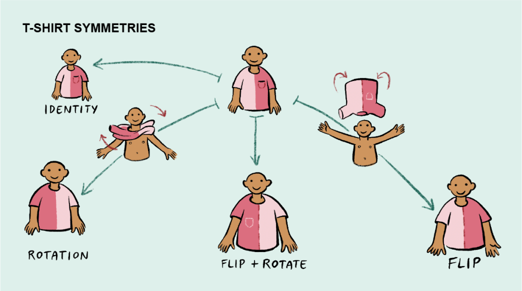
...mathematics is the art of giving the same name to different things.

— Henri Poincaré
"L'avenir des mathématiques"
Science et Méthode
Flammarion, Paris, 1908.

Different things that deserve the same name



images by Matteo Farinella



Isomorphic $=$ same $+$ shape

Some different things deserve the same name because they have the "same shape."

$\acute{\iota}\sigma o\varsigma$ "equal" $+$ $\mu o\rho\phi\acute{\eta}$ "shape"

In conventional mathematics, the group of Mattress Symmetries and the group of T-Shirt Symmetries are isomorphic, meaning that they have the "same shape" as symmetry groups.

$$\mu\colon \text{Mattress Symmetries} \cong \text{T-Shirt Symmetries}$$

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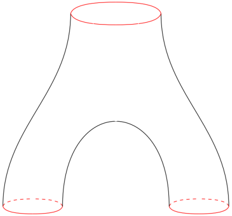
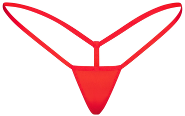
Via the equality $\mu : \text{Mattress Symmetries} = \text{T-Shirt Symmetries}$ the same is true of the group of T-Shirt Symmetries — which is bad news if you're trying to get away with wearing the same shirt day after day after day.

Different things that deserve the same name





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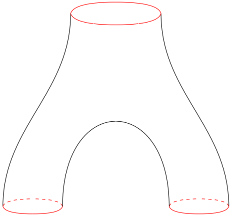

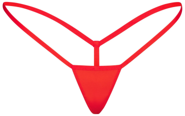

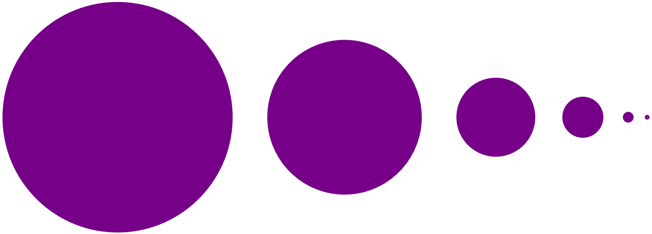

Equivalence = equal + worth

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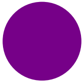
 $\simeq$  and  $\simeq \cdot$

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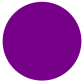
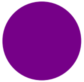
 $\simeq$  and  $\simeq$ $\cdot$

Extending the queering of equality up to a higher dimension, there is a sense in which

μ :  $=$  and τ :  $=$ $\cdot$

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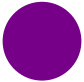
 $\simeq$  and  $\simeq$ $\cdot$

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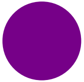
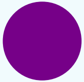
μ :  $=$  and τ :  $=$ $\cdot$

Theorem (structure identity principle). Via μ :  $=$  and τ :  $=$ $\cdot$ these spaces have exactly the same homotopy-theoretic properties.

Formally queering equality

In type theory mathematical sentences take the form of types A, B, C.

A term $x : A$ in a type then provides a proof of the encoded statement.

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Identity types are governed by the following rules:

- For any type A and terms $x, y : A$, there is a type $x =_A y$.
- For any type A and term $x : A$, there is a term $\mathsf{refl}_x : x =_A x$.
- For any type $P(x, y, p)$ defined using terms $x, y : A$ and $p : x =_A y$,
  - if there is a term $d(x) : P(x, x, \mathsf{refl}_x)$ for all $x : A$,
  - then there is a term $J_d(x, y, p) : P(x, y, p)$ for all $x, y : A$, $p : x =_A y$.

No nonsense: it's only meaningful to identify things in a common type.

Reflexivity: anything is identifiable with itself.

Indiscernibility of Identicals: if two things are equal,
then they have exactly the same properties.

Univalence and its consequences

The univalence axiom relates the identity types in the universe of all types $\mathcal{U}$ to equivalences between types.

"Identity is equivalent to equivalence."

$$\text{univalence} : (A =_{\mathcal{U}} B) \simeq (A \simeq_{\mathcal{U}} B)$$

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The things that deserve the same name:

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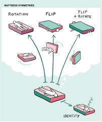
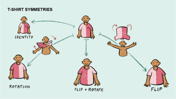
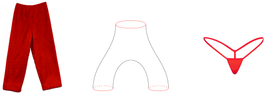
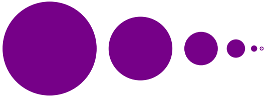
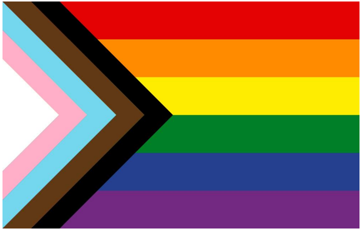
- 



- 
- 

are terms belonging to a common type.

As a consequence of the univalence axiom: identifications — that is, witnesses to equality — recover mathematicians' intuitive notions of sameness.



Thank you!