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## The Newsletter of the Mathematics Graduate Student Association

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Issue 3

September 2025

### Welcome!

It's the start of a new academic year! If you're an incoming Master's or PhD student, I extend a warm welcome on behalf of the MGSA and the Newsletter Committee. Whether you're just starting out or a veteran of the department, I hope this newsletter can offer a bit of a diversion during this often stressful and chaotic time.

Among the diversions in this newsletter, you'll find some of our regular features, like the puzzle column (page 6), math-themed crossword (page 7), and comic (page 4). Also check out some of your fellow students' responses to your submitted questions in the Q&A column (page 11).

As grad students, we tend to be quite isolated in our own work, but I hope this newsletter can offer a sense of community by giving us a place to share our interests and highlighting our diverse experiences. In this issue, Maziar Farahzad discusses the importance of regular exercise (page 5), and Nitit Jongsawatsataporn con-

vinces you to try out a beloved video game series (page 9). If you're interested in contributing to the newsletter, find out how on page 12. Spread the word about your field of math; write about a favourite hobby or pastime; review movies, albums, or restaurants around campus; or even dive into a topic you want to learn more about!

Another one of the goals of the newsletter is to serve as a point of communication between the MGSA and the student body. Learn about how the MGSA serves you in The Inside Scoop (page 2). Consider joining the MGSA cabinet for this year and making a difference in the department! In particular, you can be an editor for the newsletter committee and have a say in future issues.

Happy reading, and feel free to share your thoughts in the feedback survey (page 12). Wishing you a smooth start to the new year!

Kevin Santos

MGSA Secretary □

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View the digital version to see past issues, participate in the anonymous Q&A, give feedback, and more.



[www.math.utoronto.ca/mgsa/newsletter](http://www.math.utoronto.ca/mgsa/newsletter)

# The Inside Scoop: A Word from the MGSA Executive Team

## Updates on the MGSA's Advocacy

by Grisha Taroyan (President)

Hi everyone! This is the MGSA executive team for the 2025–2026 academic year. We are very excited for this academic year. In this article, we want to summarize the main things about MGSA's inner (and outer) workings.

The MGSA is a student association of the math department and is a part of the larger graduate student union of the university (the [UT]GSU). As such, our primary focus is to represent the interests of math graduate students. We also dabble in organizing the social life in the department, which helps to build a stronger sense of community and solidarity among us.

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### Advocacy

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The MGSA advocates for the student body and negotiates with the department to achieve what students want.

Each year, the MGSA sends out an academic survey to gather feedback from graduate students. This survey is a crucial tool for understanding what graduate students actually care about. The MGSA Graduate Affairs Committee analyzes the feedback and develops an advocacy strategy to deal with the issues we face. Some of last year's wins:

- We changed the qualifying exam (qual) system: now, instead of one incredibly hard exam we have topics-based quals.
- We advocated for and got a new year-long course on algebraic geometry.
- We pushed for students from under-represented areas (like applied math and math/physics) to have fewer mandatory core courses.
- We advocated for a graduate teaching course, which will hopefully be offered starting next year.

- We instituted almost 20 (out of 22 total) topics courses that were requested by grad students.

We weren't able to get Algebraic Geometry recognized as a core course, but this is on the agenda for this year. The academic survey is **extremely important** as a tool for MGSA's direct democracy, so please participate and share your opinions! The survey will be released around the end of September.

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### Social events

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The MGSA organizes various social events throughout the year to make us feel more like a community, rather than just a group of individuals trying hard to get out of this place (hopefully with a degree).

Some of the regular events we hold:

- **Teatime** is a traditional meeting place where students and faculty come together at the end of the week to chat and have fun. This year it is running **every Friday at 4pm**.
- The **Interdepartmental Colloquium** is a series of talks featuring graduate speakers from various departments, providing a space for students from math and other departments to get to know each other. In the past, we have run colloquia with the physics and computer science departments!
- The **Faculty-Student Mixer** is an informal event designed to introduce grad students and faculty to each other. It usually happens around the beginning of the winter term.

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## Academic events

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The MGSA also hosts a variety of academic events. These events include:

- The **Graduate Student Seminar** is a traditional seminar-type meeting where graduate students present something they are interested in from math and beyond. Everyone is encouraged to present, especially if you do not have a lot of presentation experience, as the stakes are really low.
- The **Directed Reading Program** is a semester-long program that runs in spring where graduate students mentor undergraduate students in advanced topics, like a small research

project. Grad students can get experience supervising research projects, while undergrads can learn about topics usually not covered by standard courses (or maybe even get some research experience).

- The **Bird's Eye Conference** is an annual event showcasing various research areas the graduate students are working in.

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## Come talk with us

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Starting this year some of the meetings of the MGSA executive cabinet will be open to all graduate students (without voting power). We will announce the dates and locations through the MGSA newsletter. □

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## Join the MGSA cabinet!

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We are opening a call for students to join the MGSA cabinet. This is a great opportunity to get involved, make a difference, and represent your fellow graduate students. You will also get a chance to meet many new people and get a feeling for how the department really works. Use the following QR code to sign up!



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## Your 2025–26 MGSA Executive Team

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- Grisha Taroyan (President)
- Osama Farooqui (Vice President)
- Tresa LeBlanc-Doucet (Academic Chair)
- Alex Kroitor (Social Chair)
- Austin Sun (Treasurer)
- Kevin Santos (Secretary)

# The Math Lounge

by Malors Espinosa Lara



# On working out for grad students

by Maziar Farahzad

The importance of working out cannot be overstated, especially for us grad students with mostly sedentary lives. Yet, it is often difficult to fit physical exercise in between work. This piece is a path along a flow chart of actually getting to do your exercise. And as such, this essay should not be taken as a scientific piece; that would be too much responsibility for the author. It is more aimed as a starting point for a conversation about one of the difficulties that we face in our lives as grad students: how to consistently include working out in our busy and sometimes tedious grad life.

Working out is absolutely necessary for maintaining a healthy lifestyle, as a grad student or otherwise. That's probably obvious, but here's a bit of motivation for this claim: we spend most of our days sitting at our desks thinking about problems or stressing about them, or in lectures listening to talks, again usually sitting. Arguably, our bodies were not designed to be grad students.

There is significant research on the correlation between prolonged sitting and hamstring tightness,<sup>1</sup> shortened hip flexor muscles which in turn affect your posture and cause lower back pain.<sup>2</sup> These are all somehow correlated with neck muscle tightness which is for instance exacerbated by staring at our monitors among other habits.<sup>3</sup> I'm way out of my depth here but the point is sitting too long makes you feel pain.

But of course there are a lot of other health-related reasons to work out. The important thing is to find your reason and

make it clear to yourself what it is that makes you want to work out. This will also help you with finding the type of workout you'd like to do. Find one that brings you joy.

Then, eliminating distractors is key to actually keep going to the gym or wherever you do your workout, which by this point you're super motivated for. This is probably the thing that kills routines the most. Finding some time in the day without conflicts with your other life plans can be helpful. This is what requires commitment. Finding people that would also like to work out and planning your workouts together can help too. In the end however, it all depends on you (at the risk of sounding too advicey). Putting aside some time early in the day or later in the day can help.

But say you are motivated and have also gotten rid of distractors, but still your inner voice says: "I don't know how to do it and prefer to sit on my chair doing nothing over working out." Having your workout planned out can help, or at least your gym (or home workout) bag prepared. Having a trainer would be fabulous, but the Athletic Centre's cheapest option for a personal trainer is 420 dollars for students, which is for only six sessions. This is quite expensive. Maybe the department could subsidise that? Online, there are a lot of cheaper/free resources (but be careful not to hurt yourself).

Anyways. The important thing is to personalize your workout plans, and not take the author's essay as actual advice. □

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<sup>1</sup>Effect of prolonged sitting on hamstring muscle flexibility and lumbar lordosis in collegiate student [link]

<sup>2</sup>Association between sitting and occupational LBP [link]

<sup>3</sup>The influence of different sitting postures on head/neck posture and muscle activity [link]

## A Classic Problem

A rectangle  $A$  is tiled by finitely many smaller rectangles  $R_i$ , each of which has at least one side of integer length. Show that  $A$  has at least one integer side length.

## Dominoes

Let the twinned domino tile in  $d$ -dimensions be defined as a  $5 \times \overbrace{1 \times \dots \times 1}^{d-1 \text{ times}}$  cuboid with its central cube removed. Such a tile can tile  $\mathbb{Z}^d$  if and only if  $d \geq 2$  (I found constructing the tiling for  $d = 2$  amusing). Show however that it cannot tile any  $a_1 \times a_2 \times \dots \times a_d$  cuboid.



Figure 1: Twinned domino with  $d = 2$

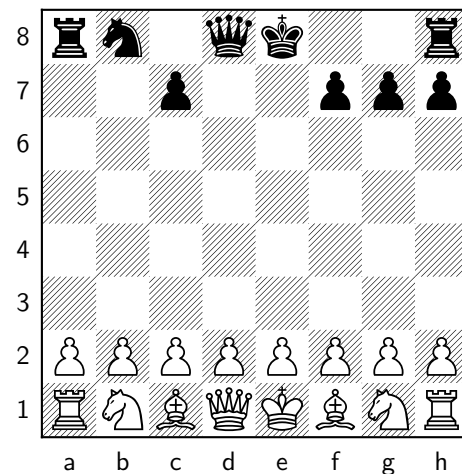
Good luck! E-mail all solutions to [mgsa\[at\]studentorg\[dot\]utoronto\[dot\]ca](mailto:mgsa[at]studentorg[dot]utoronto[dot]ca)

## Solutions for Previous Puzzles

### Math Puzzle

There are several constructions which work, the easiest to state I know of is  $(\mathbb{Z}/2\mathbb{Z}) \times \mathbb{Z}_3$ , where  $\mathbb{Z}_3$  is the 3-adic integers under addition.

### Chess Puzzle



Can you find a legal chess game ending in this position after White's 8th move? How many such chess games are there?

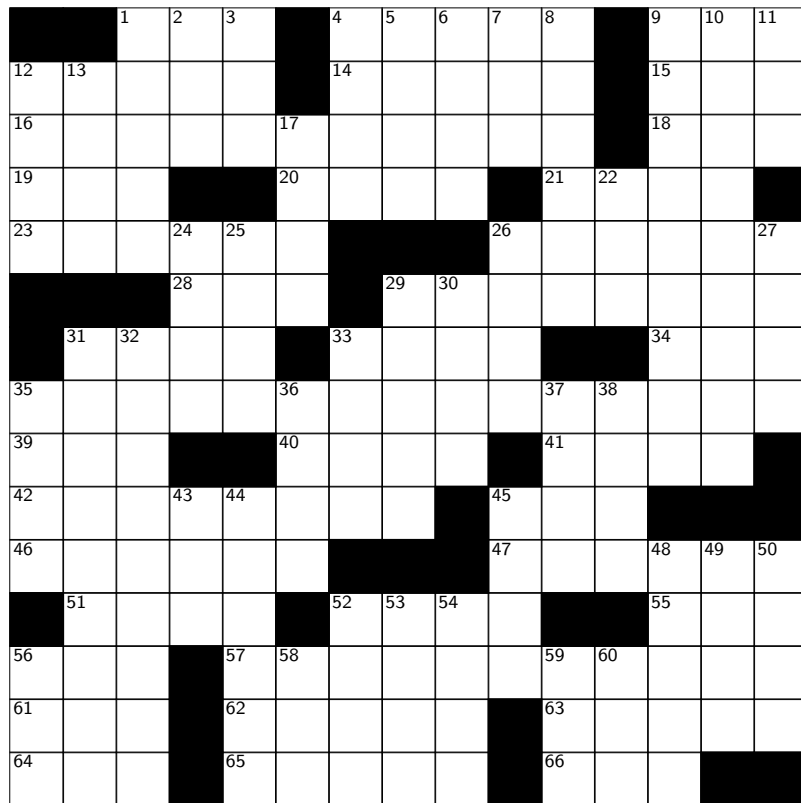
### Chess Puzzle

White's only way to avoid the stalemate is  
 1. e3 Rxe3+ 2. c3 Rxc3+ 3. Ka2 Ra3+ 4. Kb1 Ra1+ 5. Kc2 Rc1+ 6. Kd3 Rc3+ 7. Ke2 Re3+ 8. Kf1 Re1+ 9. Kg2 Rg1+ 10. Kf3 Rxc3+ 11. Ke2 Re3+ 12. Kd1 Re1+ 13. Kc2 Rc1+ 14. Kb3 Rc3+ 15. Ka2 Ra3+ 16. Rxa3#



# Crossword

by Kevin Santos



## Across

1. Blue baseball mascot
4. "Can't we all just get \_\_\_\_\_?"
9. Admonition in a library
12. Drawbacks
14. Awaken
15. Greek letter sometimes used to represent the ratio between the circumference of a circle and its radius, which some advocate should replace pi completely
16. \*Concerning a global perspective, in a way
18. Verb that sounds like its middle letter
19. Ray blocked by SPF
20. Certain hyperbolic function
21. Breaded chicken or eggplant dish, briefly
23. \*Pioneer in functional analysis
26. \*\_\_\_\_\_ graphics (Type of computer illustration based on coordinate geometry)
28. Steamed bun
29. Lose it
31. Election season staple
33. Na<sup>+</sup> and Cl<sup>-</sup>, for example
34. Play the least golf in a game of golf, say
35. "I need some time alone"... or, request

that can be fulfilled by the answers to the starred clues?

39. Director Ang or Spike
40. Canada's Wonderland offering
41. Makes a mistake
42. Bitter quality
45. Ms. Lopez, to tabloids
46. \*Toronto band featured on the soundtrack of "Scott Pilgrim vs. the World"
47. \*Type of transformation
51. "Last Christmas" group
52. Function that satisfies the triangle inequality, among other properties
55. Scam
56. Bygone space station whose name means "universe" in Russian
57. \*Odds
61. Spanish bear
62. Russell's realm
63. High-IQ society
64. Kitten sound
65. Act theatrically
66. Glutton

### Down

1. Its capital was once named Edo
2. In the past
3. Designer handbag initials
4. Jason's ship of myth
5. Clark Kent's partner
6. "That hurts!"
7. American surveillance org.
8. Writing implement with thick ink
9. 32-Down a government, perhaps
10. Building blocks of a branch of analysis
11. Shade
12. Word with pay or ticket
13. \_\_\_\_ Scotia
17. Cuatro y cuatro
22. Appliances often only used in the summer (Abbr.)
24. Willing partner?
25. Serene
26. Workbench tool used for gripping
27. Descartes' forename
29. One who has two shoes?
30. "My treat"
31. How a bump function may be defined
32. Depose
33. "Are you sure?"
35. Glitz
36. Ariel's beau
37. Solipsistic concern
38. Many a PhD holder
43. NPR host Glass
44. It may be revealed by a smile
45. Door part that sounds like it could be made of strawberries
48. Extra benefit, in an idiom
49. Certain 62-Across gates
50. Mononymous Irish singer
52. It won't happen
53. Death notice, for short
54. Marathon, e.g.
56. Honoree on the second Sunday of May
58. Largest museum in Canada, in brief
59. Little devil
60. Hawaiian gift

## Solution to the Previous Crossword

D	E	C		P	E	P	P	A		S	E	D	A	N
E	X	O		A	S	H	E	D		I	R	E	N	E
E	P	S		W	E	D	D	I	N	G	R	I	N	G
P	L	E	A					R	E	I	N		C	A
F	O	C	U	S	G	R	O	U	P		B	E	L	T
A	D	A	S	T	R	A				W	O	R	S	E
K	E	N		R	I	N	D			T	H	Y		
E	S	T		A	L	G	E	B	R	A		I	D	C
				O	W	L		T	O	O	T		N	R
A	M	A	S	S				B	U	I	L	T	I	N
P	A	G	E		W	H	E	A	T	F	I	E	L	D
O	N	E		I	P	O	D				U	G	L	Y
L	U	N	A	R	M	O	D	U	L	E		E	B	B
L	E	T	G	O		K	I	R	B	Y		R	I	A
O	L	S	E	N		S	E	N	S	E		S	T	R



# The Reason You Should Play Touhou

by Nitit Jongsawatsataporn

"I once imagined what would happen if a hail of bullets fell on shrine maiden" -- no one. The previous sentence is a joke I found on Reddit. I like it so much as it accurately describes the Touhou Projects, a game you play as a shrine maiden, Reimu Hakurei, and try to dodge bullets!

## What is Touhou?

Touhou Project is a series of 20 (and on-going) danmaku games. Danmaku is a composition of dan, whose literal translation is a bullet, and maku, whose literal translation is a curtain. In combination, one can think of a game where you see a hail of bullets falling down. If that does not make sense, look at the bottom picture. Any circular (or oval) object you can see is a bullet that must be dodged. Luckily, your character is only a few pixels wide, so you will be able to go between almost any gap (as long as you can find one ☺). If it looks too hard, don't worry; multiple difficulties accompany any skill level!



Figure 1: Yuyuko's penultimate spell: Boundary of Life and Death

## Gameplay

Here's the typical Touhou interface (taken from Touhou 13: Mountain of Fate). The game is divided into two parts: story mode (game start) and Extra mode (extra start). You will have access to Extra Mode, a harder and shorter part. The story mode is divided into six stages; each of them consists of a first half, mid boss, second half, and the boss. The goal of Touhou is to either kill all the fairies and bosses or wait until the timer hits 0.



Figure 2: TH13 menu page

Picture 3 is a screenshot from the gameplay of the Touhou TD Stage 4 boss. To pass, you either have to survive until the counter (48.10 seconds) passes or the boss's health (the arc around the boss) is gone. You can attack the boss by pressing z or activate the bomb by pressing x. You also need to avoid all the attacks, which consist of green balls and yellow arrows. To do so, simply press the up, down, left, or right arrow to the direction you want. You can also press shift to activate focus mode, and it will display your hitbox and slow down your speed. When you pass a certain phase, the game will proceed to the next spell. Repeat that until you defeat the boss, and then repeat it until you clear all six stages!

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## Why should you play Touhou?

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**1. Music** Touhou is famous for its music. In particular, one could argue that Touhou songs are in their own genre because of their repeated usage of the (purely) synthetic instrument and certain chords. One of the most popular songs in the fandom is "Cirno's perfect math class," a fan remix of the renowned stage 2 boss theme in Embodiment of Scarlet Devil (Touhou main game #6) called Beloved Tomboyish Girl.

**2. Gameplay** While the game could look intimidating at first, it was not as bad as long as you slowly climbed the difficulty level. It will take a while, but it is a fairly fun and relaxing (on a lower difficulty) game after enough practice!

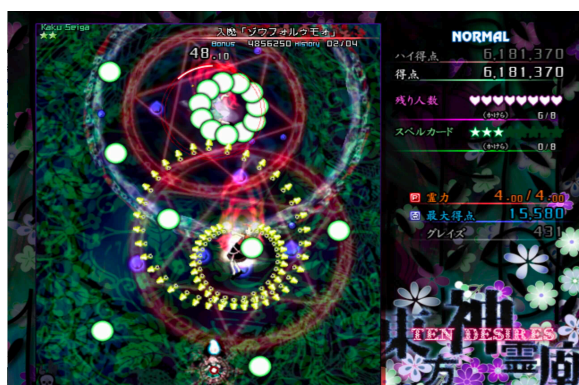


Figure 3: Boss fight (in practice mode)

**3. Cultural Significance** Playing Touhou would give you an excuse to dive into the lore of (ever increasingly more complicated) Gensokyo, a place where the story took place. Touhou is (or at least used to be) one of the leading meme creators (albeit the influence of the Touhou meme now is much less than its peak). If you ever see a Fumo doll, Bad Apple music video, or a yukkuri meme (a character with only a head), keep in mind that they all originated from the Touhou community.

**4. Cute character designs** Need I say more?

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## How do I play Touhou?

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Let's say that somehow the first half of this article convinces you to start diving into this complex world of anime girls dodging bullets. How do you actually get to play one (legally)? With the release of multiple modern Touhou installments, you can grab one from Steam! One caveat is to distinguish between the main installments and the side project. The main installment games would be purely danmaku, and the side project could range from danmaku to a Street Fighter-style game. The way to make sure you buy the main installments is to search the name before buying or navigate through a thick Japanese text description and check whether it is in the main series or not. My recommendations are Touhou 10: Mountain of Fate, Touhou 13: Ten Desires, and Touhou 16: Hidden Stars in Four Seasons. Also, in almost every Touhou game, you can find an English patch if you are curious about the story.

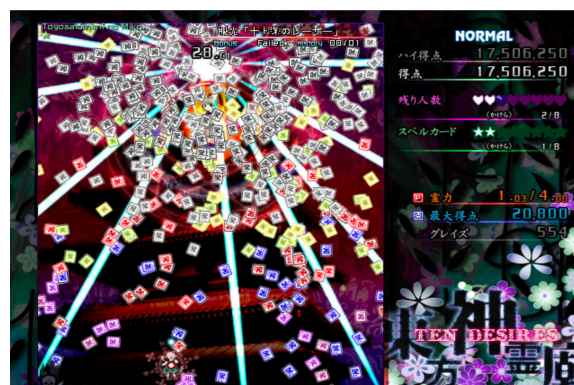


Figure 4: Penultimate spell of (normal mode) Touhou TD, Discernment "Laser of Seventeen Articles," one of the harder spells in the TD game!

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## Summary

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At its core, the Touhou Project game is a combination of good music and some activity to keep your focus (think DDR, for example). It is a game that would serve as a good break from the study and research! □



# asking for a friend.

an anonymous Q&A column

Do you have a question about navigating the grad student journey that might be too embarrassing to ask? If yes, this column is for you! Each issue we'll collect anonymous questions from you readers, and collect your (short) responses to them too. You can ask fun questions too!

Here are the questions for this issue (slightly paraphrased). Tell us what you think about any of them, and send your own questions to us using this survey.

- How do people connect with the broader research community outside campus?
- Who is the most important person that you met in grad school?

## Responses to Questions from the April 2025 Issue

### Did anyone pick up a new hobby during grad school?

Yes absolutely, such as becoming a member of the Hart House singers.

Anonymous student

Yes! As a joke I started to draw pictures on my notes when my friends asked for them. Then I started to draw them on every single page of my notes, and now I have just been doing it for fun. I've been thinking of even borrowing a book or taking lessons to improve.

Newsletter Editor

### What helps you come up with your own original ideas for research?

Trying out small ideas, learning from why things didn't work, and rapidly iterating; talking to people; keeping a balance research & living life; staying active.

Anonymous student

For me it's been very productive to try to understand everything in my own terms. When I am digesting the background for a research project, I often find the arguments made by previous researchers either impossible to understand or "magical" in the sense that it works but I don't understand why. I think very visually, so when some theorem is proven by an algebraic argument, I try to translate it into some "proof by picture" that seems more convincing to me. For example, spectral sequences seemed like black magic to me, but I spent a lot of time translating some algebraic proofs for spectral sequences into geometric proofs. This helped me to find "my own reason" for why spectral sequences work, which is an original idea that underpins one of my current projects.

Newsletter Editor



## How to Contribute

Do you have some cool math to explain, or some art or craft to show us? Do you have someone you'd like to interview? Would you fancy a chance to dive into a non-math topic by writing a short essay about it? Send your potential ideas to [mgsa \[at\] studentorg \[dot\] utoronto \[dot\] ca](mailto:mgsa@studentorg.utoronto.ca), and one of our editors will be in touch. No commitment required at this stage— let's just talk and see if anything cool emerges! You can also help us by giving feedback on this issue at this [survey](#).

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### Credits

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