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Words From the Editor

Paradox has a long history of encouraging and documenting mathematical super heroes of all descriptions. We are there when they are born (even if it’s through the fourth dimension), when they hone their powers, we are there egging them on to perform ridiculous feats of alcohol- and caffeine-fuelled mathematical daring at their 21st parties, and we are there, wiping away a tear, when they vanquish their first evil economic rationalist university administrator or crazed physicist. In this edition, the last of 2005, the full exploits of Paradox Kid and Knot Man are related in full.

Paradox Kid first appeared in Paradox in 1999, and continued until 2001. It was written by Jeremy Glick and Sally Miller. Dan Mathews and Priscilla Brown took the baton in 2002 and started to write/draw Knot Man. We hope you enjoy this collection of their finest work.

— Nick Sheridan

Preface to a Compendium of Mathematical Superheroism

In the beginning was mathematics. Mathematics may precede us, but is revealed to us by the great. As long as there has been mathematics with us, there have been the great. Greatness produces mathematics; mathematics produces greatness; mathematics is greatness. And the mathematical superhero personifies the zenith of this greatness. Who are they? Where do they come from? What is their purpose? What do they do? Why? And why do they all have such bad fashion sense?

They were not called upon. They were not crowned in glory. They were not elected, selected, or appointed to the job. They were not born with a silver spoon; even though some were born through the fourth dimension. Some were discreet; but others were continuous. Some were straightlaced; but others are a little more knotty.

For the mathematical superhero is a complex character.\(^1\) The mathematical superhero is a function of many variables.\(^2\) The mathematical superhero is just one element in a free associative group.\(^3\) The mathematical superhero knows no boundaries\(^4\) — something of a closed manifold.\(^5\) The mathematical superhero

\(^1\) Complex? Get it? 5 points for appreciating the mathematical pun. Character? Get it? 30 points for this one.
\(^2\) 10 points.
\(^3\) 15 points.
\(^4\) 10 points.
\(^5\) 40 points.
superhero, in the end, though there are variations, solves the problem, and with minimal energy — something of a geodesic. He or she may be rather twisted, but transforms well under change of variables — something of a tensor, really. The mathematical superhero comes in many varieties — is often stalked — but is always enough to foil any evil scheme from any point in the spectrum, from the most generic to the most maximal. No, greatness was thrust upon them. Their geekiness knew no bounds, and they revelled in things other than sport. Their intellects overtook them, and could only express itself in strange and bizarre outgrowths: spiky-haired protrusions, strange capes and outrageous socks and sandals. And in matters linguistic, a tendency — or rather, an irresistible compulsion — to pun relentlessly and atrociously on mathematical terms, well beyond any reasonable limit. They could not help themselves; they could not avoid it; that would be an infinite descent. Powered with coffee — the product of the cup — more bad mathematical puns have been made than was ever thought possible, and mathematical harmony has been restored to the universe time and time again.

For not everyone can be a mathematical superhero. Not everyone can make terrible mathematical puns as consistently and as appallingly. Not everyone can save the world from a maniacal physicist/economist/vice-chancellor /(insert your least favourite non-mathematical person here) with an evil and suitably twisted and ridiculous plan to take over the world — or, much the same thing, the mathematics department. Not everyone can be so utterly inept at every facet of human endeavour other than world-saving heroism. Not everyone refers to a donut as ‘genus-1 nutrition’. And not everyone is so comfortable with Cauchy’s formulation of continuity as to be named after its essential variables. Yes, the world needs mathemagicians to look up to. Yes, even if they arise from the demented vision of a twisted author in the rather obscure genre of

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6 20 points.
7 20 points.
8 Bonus 50 points for your knowledge of differential geometry!
9 10 points.
10 30 points.
11 10 points.
12 50 points.
13 30 points.
14 40 points.
15 30 points — bonus 50 points if you know the definition of a scheme!
16 Minus 200 points for knowing way too much algebraic geometry!
17 Minus 500 points more, this is getting ridiculous.
18 Minus 50 points.
19 Oh yes, beyond any reasonable limit: 20 points.
20 20 points.
21 50 points. (No, not for ‘product’, but for ‘cup product’.)
mathematical comics.

But we should not go too far. We should not put these heroes on a pedestal. For in a sense, the mathematical superhero is everywoman and everyman. Is there not really, deep in our hearts, a mathematical superhero in all of us? We need to unlock our potential, remove our cutoff functions, and drink too much coffee. We must disgorge ourselves of all selfishness, avarice, and fashion sense. We must rail against injustice, iniquity, and inelegance. We must take action, when necessary, and apply our knowledge to the real world, sometimes, when we really have to, and physicists or engineers will not do it for us. In this humble collection, you will see some of the finest examples of mathematical superheroes ever produced. You will be taken to heights of superhero magnificence greater than $N$, for any given $N > 0$. So let us proceed.

— Daniel Mathews, 8/10/05, Stanford, USA

Results

- **400+:** You are truly one of the great. You have *more brains than the basket behind a guillotine*, and *more sexual allure than a hyperbolic attractor*.

- **300–400:** You are almost there. Try wearing socks and sandals more often. You might even like to get yourself a cape or a *supervisor*.

- **200–300:** You are well on your way. You should read more comics about the exploits of mathematical superheroes. Lucky, then, that you are reading this. But please refrain from battling any but the most minor villains. You will need yet to obtain *more power than a quintic* ($5$).

- **100–200:** Above average. You have potential, but you have much to learn in our ways. Yes, there is a mathematical superhero inside you. But you will need to obtain a *transcendental extension in all fields* first.

- **50–100:** You have yet to make an impression in the world of mathematical superheroism, but yet you can succeed. You have made a start, but there is a long way to go. Your first task is to become *more caffeinated than a convoy of long-haul truck drivers* and *more poised than a stable 2-cycle*.

- **0–50:** Perhaps you would be better leaving the crazed physicists and economists and vice-chancellors to others.

- **Less than 0:** You know way too much algebraic geometry. *Shame on you!*
The universe is a lonely and empty 3-manifold and from the back row of theatre A, P.K. was finding it particularly boring.

Oh no! It's perturbed Bayshun!

The Insane psychotic physics student!

They say he was exposed to too many gamma rays as a child...

Who knows why he ran - maybe fear, maybe courage, maybe love for his abacus... we'll never know for before he could reach the door he was fried by perturbed...

Look, perturbed - I won't stand by and watch while you electrocute innocent maths students.

Mathematics 101

Assessment:
- Exam 60%
- 4 x Assignments 10% each

Suddenly...
P.K. dons his super visor and is transformed into **Paradox Kid**, with **more power than a quintic (5)**, **more brains than the basket behind a guillotine**, and **more sexual allure than a hyperbolic attractor**.

After a fierce battle, Paradox Kid delivers one final crushing blow, leaving perturbed Bakshun's head oscillating uncontrollably...

And remember everyone - the equation of motion of perturbed's head is 

\[
\frac{d^2\theta}{dt^2} + \omega^2 \sin \theta + \beta \frac{d\theta}{dt} = 0
\]

...and with that, Paradox Kid returns to his seat, takes off his super visor, wipes his brow, and resumes his life as P.K. the everyday maths student.

To be continued...
It was an uncharacteristically warm day, and P.K. was basking in the sun with some friends...

How's exam studying going, P.K.? It's going okay. I'm a bit worried about 132, but otherwise...

Suddenly... Hey you!

Hey, what's going on, Stephan?

My friends and I were studying for exams and the masked invigilator came and stole all our books - if we don't get them back, we'll fail for sure!

Oh my Gödel!

The masked invigilator - who's that?

She used to invigilate Melbourne Uni. exams, until one day she swapped the '98 Comp Eng. 1 exam with the '97 one. Administration threw her out in disgrace. She claims she's innocent, and for revenge has vowed to wreak havoc on exams till the end of time.

I can't stand by and watch while my friends are having their academic reputations jeopardised - this sounds like a job for Paradox Kid!
P.K. Dons his super visor and is transformed into **Paradox Kid**, with

**More power than a quintic (5),**

**More brains than the basket behind a guillotine,** and

**More sexual allure than a hyperbolic attractor.**

**Don't let the masked invigilator get away!**

**There she goes, Paradox Kid - she's running into the library!**

**Give up, masked invigilator!**

**I knew you'd find me, Paradox Kid, but I'm ready for you!**

**Shhh!**

**Don't worry - with these initial conditions, if I take the geodesic* to the library I'll reach her in 128 seconds.**

*Locally distance-minimising path.

**Prepare to be torn into an arbitrarily large number of pieces of size epsilon and randomly distributed across the university.**

**The library is a place of silence!**

**Hooray for Paradox Kid!**

**Hooray for the librarian!**

**Hey Paradox Kid, can you sort through these books and find mine?**

**Sure Stephan - in fact the quicksort algorithm is O(n log n).**

**And the masked invigilator? Well, every now and then, a mysterious masked figure is seen helping with chores around the maths library...**

**And mine?**

**And mine?**

**And mine?**

**To be continued...**
Love is a complex function of many variables.

Things were different in the early seventies. Science had plenty of funding. People wondered whether the four-colour hypothesis was true, and Paradox Kid had not yet been born. In fact, if not for a series of statistical anomalies he may never have been born at all!

It all began at the Maths Olympics (some things never change)...

Oh, I'm really really really really sorry!

Take a chill pill baby, maybe our collision was, like, in the stars!

He-he-he! Hey, maybe we could, like, converge later at the seminar on Friday?

I'd love to!

After the seminar...

Funky talk, Mandelbrot!

Thanks! Hey, check out that chick's smooth curves!

Yeah, she's quite a babe - our paths intersected at the Maths Olympics...

Political correctness had not yet gained momentum.

Hey, wanna come back to my place and try to make a self-replicating machine in Conway's Game of Life?

Sure, call me - my phone number starts of life at the 2542624th digit of Pi...

Oh, 4260655?

Wow - you're my kind of man!

Hey, I know another way to make a self-replicating machine - wanna try?
Some time later...

Mathematics Conference 1973

All my Fortran programs are still not running fast enough. Any ideas?

Why don't you try replacing the 4-digit year field with a 2-digit one? It won't be a problem for ages...

Suddenly...

Quick - get a doctor, one of the conference speakers is about to give birth!

But the Med Faculty is about 600m away... or using the Tausiab metric even 800m. Oh, but with the discrete metric only 1 metre!

Wait! I may be able to help - I'm a dem surgeon.

Quick, help, something's going wrong!

Don't worry, this looks more familiar than the real and complex analysis exam!

If I attach a Mobius band here, we'll turn your womb into a Klein bottle and the baby can pop out through the fourth dimension...

And so it happened that Paradox Kid was born. By emerging through a manifold embedded only in four dimensions, he was bestowed with strange mathematical powers, which he has ever since used to keep the Richard Berry Building a place of freedom, equality, and commutativity...
The Adventures of Paradox Kid

PK, the I.T. people are looking for you - there's a big problem!

It's those new iMacs, they're too brightly coloured! Students keep passing out in lab classes.

Oh no, I hope the photocopiers aren't out of toner again.

Let's take a look...

No one can stand to be in the labs for more than 5 minutes. Luckily an ex-MUMS president is rescuing fainted students.

How can he take it? He's colour blind...

The only person enjoying this is the vice-chancellor, who's raising funds for the university by selling sunglasses to the students.

Sunglasses $20

Hmmm... this is a harder problem than the Goldbach conjecture. I'll have to take a closer look.

The VC is in
"AERGH, THIS IS TERRIBLE! ...HEY, WHO ARE THOSE TWO?"

"MULDER AND SCULLY! WHAT ARE YOU DOING HERE? OUR SCANNERS PICKED UP AN ENORMOUS AMOUNT OF GAMMA RADIATION COMING FROM THIS ROOM WE ASSUMED ALIENS HAD LANDED. APPARENTLY IT'S JUST THESE IMACS.""WHAT CAN WE DO? LAB ATTENDENCE IS LOWER THAN ANY GIVEN E>0."

"MAYBE YOU CAN USE THESE GAMMA RADIATION ABSORBERS THAT WE FOUND IN AN INCA PYRAMID LAST WEEK..."

"...JUST PUT SEVEN OF THESE ABSORBERS ON TOP OF SEVEN OF THE IMAC MONITORS, BUT REMEMBER, IF TWO ROWS AND TWO COLUMNS OF IMACS CONTAIN ALL THE ABSORBERS THEN YOU'LL Usher IN An AGE of DARKNESS, TERROR, AND PROOFS LEFT TO THE READER."

"CAN YOU HELP P.K. PLACE THE SEVEN GAMMA RADIATION ABSORBERS ON TOP OF THE IMAC MONITORS (A 4x4 GRID) SO THAT NO TWO ROWS AND TWO COLUMNS CONTAIN ALL THE ABSORBERS?"

"THE PERSON WHO SUBMITS THE BEST ANSWER TO THE MUMS. PIGEONHOLE (NEAR THE MATHS & STATS OFFICE) WILL WIN A CAMEO APPEARANCE IN THE NEXT EDITION OF PARADOX KID!"

"BONUS: PROVE THAT WITH LESS THAN SEVEN GAMMA RADIATION ABSORBERS PLACED ON A 4x4 GRID ONE CAN ALWAYS PICK TWO ROWS AND TWO COLUMNS THAT CONTAIN THEM ALL."
Two fields, both alike in obscurity,
in fair maths and stats where we lay our scene,
from ancient grudge break to new mutiny,
where administrative blood makes administrative hands unclean.
From forth the fatal research of these two foes,
a pair of dot-cross'd mathematicians take their career,
whole misadventured piteous overthrows,
do with their fate bury their research groups' strife...

Oh, but before we get into the story, we have to award a prize to Andrew Rogers for solving last issue's problem!

Thanks, P.K.!

Anyway, this is the story of $\rho$-meo (rho-meo) and JuliaSet, two of the top young researchers of this department. $\rho$-meo was a new honours student in the pure maths research group. JuliaSet was a young lecturer in applied. For years the two research groups had hated each other, and people from one group were forbidden to write papers with people from the other...
...ONE DAY p-MEO, DESPITE ALL HIS GROUP’S WARNINGS TO THE CONTRARY, ATTENDED A SEMINAR GIVEN BY THE APPLIED GROUP. JULIASET WAS GIVING THE SEMINAR THAT DAY.

HE FELL IN LOVE WITH HER RESEARCH, AND AS SOON AS HE ASKED A QUESTION AFTER HER TALK, SHE FELL IN LOVE WITH HIS MATHEMATICAL INTELLECT TOO. THEY KNEW THEY’D HAVE TO WORK TOGETHER.

SO, MANY EVENINGS p-MEO WOULD CLIMB INTO JULIASET’S OFFICE VIA THE BALCONY AND THEY WOULD RESEARCH TILL DAWN.

THE TIME WAS APPROACHING WHEN p-MEO WOULD HAVE TO CHOOSE A SUPERVISOR. HE DESPERATELY WANTED TO BE SUPERVISED BY JULIASET, BUT HIS GROUP WOULDN’T HEAR OF IT.

NO, WE WON’T HEAR OF IT! YOU CANNOT BE SUPERVISED BY AN APPLIED ACADEMIC! WE HAVE ARRANGED FOR A PURE LECTURER TO TAKE YOU UNDER HIS WING, AND YOU WILL STUDY UNDER HIM.

BUT...
Despondent, p-meo turned to the admin. staff for help...

What can I do? I have to hand my form in to you by tomorrow and I want to be supervised by juliaset, but it looks like I'll have to be supervised by a pure academic instead.

Well, do you really love her research area?

Yes! I swear that if I have to do a pure thesis I'll put on a left focus t-shirt and walk through the commerce department.

No, please p-meo, they'd kill you...

Why don't you install a demo version of tetris on your computer? Everyone will assume that it's the full version and that you'll spend the rest of your days playing tetris. The pure people will think your academic career is over and won't want you in their group anymore. But in 30 days the license will expire and you'll be able to work again. Make sure you email juliaset to tell her it's just a demo version though.

So p-meo sent off an email to juliaset explaining his plan, and then installed a demo version of tetris. He fell into a tetris-playing daze, unable to take his eyes off the screen.

Oh no, we've lost p-meo! He's installed tetris! What a tragic waste.
So all was going to plan: the pure staff no longer thought about coercing ρ-meo to stay in their group, and juliaset had only to read her email and then wait for the 30 day evaluation period to be over before she could begin to research with her young protégé. Unfortunately...

Oh bummer, tincan* is down again. I guess I won’t be able to check my emails for a while...

Hey juliaset, did you hear? ρ-meo installed tetris on his computer! That’s just shocking; hey? It reminds me of the same...

Oh no, poor ρ-meo! What has he done?!

How can I ever work again knowing that he gave up his career rather than work with someone other than me... I’m going to install tetris too!

30 days later ρ-meo emerges from his tetris-induced daze. He runs straight to juliaset’s office to collaborate, but...

...and so ρ-meo installed the full version of tetris on his computer too, and the melbourne uni maths and stats department lost two of its finest young researchers.

Seeing their loss, the two research groups ended their feud and published many fine papers together.

So remember, despite what we learn from set theory, the whole is greater than the sum of the parts. So collaborate freely and form unions with people even if your fields are disjoint. Finally, stay away from tetris before your upcoming exams!
THEOREO J KNOT AND HIS MATHEMS FRIENDS WERE ENGROSSED IN CONVERSATION.

PARADOX HAS A NEW COMIC! COOL, HUH?

I WONDER IF PEOPLE IN THE COMIC WILL TALK ABOUT THE COMIC... OR ABOUT THEMSELVES TALKING ABOUT...

HEY GUYS! LISTEN TO THIS!

...AND THEY'RE ALL LOCKED UP IN THE COMMERCE DEPARTMENT!

EWW!

WHAT CAN WE DO TO HELP?

HOW WILL THEY SURVIVE?

HOW DO YOU PRONOUNCE THAT GUY'S NAME ANYWAY?

THIS SOUNDS LIKE A JOB FOR...

AND SO WITH TREFOL T-SHIRT AND REPLET WITH SOCKS AND SANDALS, KNOTMAN SETS OFF TO LATRASHIKIN UNIVERSITY.

...BY TRAIN OF COURSE, LIKE EVERY OTHER Uni STUDENT.

HEY! NICE CAFE, MAN!

BRIGHTER THAN A MEDIUM-SIZED SUPERNova...

FASTER THAN A CRAY SV1 TOUGHER THAN THE RIEMANN HYPOTHESIS...

MORE ELEGANT THAN EUCLIDEAN GEOMETRY...

MORE DARING THAN A ROOM FULL OF PHYSICAL CHALLENGES...

UNBENDING AS THE THIRD YEAR ALGEBRA EXAM...

WELCOME TO LATRASH.

PHYSICS

Now! Look at that RED SHIF!

COMMERCE

INTERNAL LABOUR MARKET...

TAX DEDUCTION... BLAH... BLAH...

WHERE ARE THEY?
Eventually Knotman scales the wall and enters the commerce department.

"Triivial... Blah Blah... Nonsense... Blah Coffee..."

"This knot theoretical string comes in really handy sometimes."

"Let them go $\$, you villain!"

"Never, Knotman!! What are you going to do, differentiate me?!"

THE VILLAINS ATTACK...

"Knotman! The trefoil is the (3,2)-torus knot!"

"Of course!"

"Let me just get my superstrength triple-half-twist Mobius strip!"

"What practical application do that have, you academic?! Are you trying to disorient me?"

"Scissors are of no use against my power, tangle boy!!"

"Noooo!! Trapped in a trefoil knot! Let us go!!"

"And remember kids, you can try this at home!"

"NO! I'm a framed knot!"

"And how do you produce that in \TeX{}?"

"Take this $\$-$men!"

QED
AFTER HIS LATEST BOUT OF SAVING THE UNIVERSE, THEODORE J. KNOTT HAS DECIDED TO TAKE SOME TIME OUT TO RECOVER, ON A TROPICAL ISLAND PARADISE...

...WHERE IT SO HAPPENS THAT ONE-TIME SUPERHERO AND MATHEMAGICIAN PARADOX NO. 1 IS ENJOYING HIS RETIREMENT.

PK!

THEODORE J.?

PK, I LOVED YOUR WORK! IT'S BECAUSE OF YOU THAT THE MATHS DEPARTMENT IS SUCH A FREE ASSOCIATIVE GROUP!

OH, THANKS THEODORE J. ! LET'S GO GET SOME SNACKS OF THE GENUS-1 MATHS VARIETY!

SO THEODORE J. AND PK, AFTER A HEARTY DOSE OF GENUS-1 DONUTS, REGALED EACH OTHER OF THEIR RESPECTIVE ADVENTURES...

...AND THEN ONE TIME THERE WAS THIS INSANE, PSYCHOTIC PHYSICS STUDENT!

SOUNDS DERANGED! I'LL BET HE DIDN'T HAVE ANY FIXED POINTS!

I WANT TO LEARN MORE IN THE WAYS OF DEFENDING THE MATHEMATICAL UNIVERSE! CAN YOU HELP ME?

BY GÖDEL, IT'S BEEN LONGER THAN THE PROOF OF FERMAT'S LAST THEOREM, BUT I'LL GIVE IT A TRY!

THE GREAT PK THUS TOOK THEODORE J. KNOTT UNDER HIS TUTELAGE...

THEODORE J. KNOTT, I WILL SHOW YOU HOW TO OBTAIN MORE POWER THAN A QUINTIC(5)

MORE BRAINS THAN THE BASKET BEHIND A GUILLOTINE, AND MORE SEXUAL ALLURE THAN A HYPERBOLIC ATTRACTOR!

PK TAUGHT THEODORE J. TO BECOME INVULNERABLE TO ALL DIFFERENTIAL ATTACKS.

FEEL THE E2 BE THE O2 THEODORE J.-SAN
AN EXPERT AT THE DENN SURGICAL STRIKE . . .
A MASTER OF TRANSFINITE SUPERINDUCTION
DO NOT FEAR THE LIMIT CARDINALS, THEODORE J.-SAN!
1, 2, 3, 4 . . .
w, w+1, . . .
w^2, . . .

AND GENERALLY AT ONE WITH THE TRANSCENDENTAL MATHEMATICAL UNIVERSE.

... NOT TO MENTION, OF COURSE...

THEODORE J. KNOTT'S FAVOURITE FIELD, KNOT THEORY!

KNOT 9_42!
HYPERSMALL VOLUME:
4.05686022
TOTA
AL NORM 0
NORM

VERY IMPRESSIVE!

WELL, THEODORE J., YOU HAVE GAINED A TRANSCENDENTAL EXTENSION IN ALL FIELDS, AND YOU ARE ALMOST READY TO BECOME A FULLY FLEGGED DEFENDER OF THE MATHEMATICAL UNIVERSE!

WHAT DO YOU MEAN, ALMOST?

I HAVE ONE LAST CHALLENGE FOR YOU, WHICH YOU MUST COMPLETE!

THIS SOUNDS LIKE A JOB FOR...

KNOT MAN!

KNOT MAN! RESIDENT IN TREFOIL T-SHIRT AND SOCKS AND SANDALS, KNOT MAN ARRIVES TO TAKE PARADOX KID'S FINAL CHALLENGE.

KNOT MAN, WE ARE GOING TO THE LOCAL HAIRDRESSER!

WHAT, IS THERE SOMETHING WRONG WITH MY HAIR?
You must restore order to the mathematical universe!

Inside, Russell's hairdressing was just like any other Pacific Island salon...

Hello can I...

Well, nice hairstyles around here!

Are you the local hairdresser?

Yes.

Do you cut everyone's hair around here?

Well, I cut the hair of everyone who doesn't cut their own hair...

Knot Man pondered the hairdresser's curious response...

Hmm... seems about as logically coherent as a law subject.

Audacious as a scav hunt team full of em, students...

Dashing as a style manual's chapter on hyphenation...

Unyielding as the mostow rigidity theorem...

Quicker than you can say Cauchy integral formula...

Knot Man lets fly with a witty riposte...

So, do you cut your own hair?

Well...

Um...

Knot Man, defender of the mathematical universe!

Well done Knot Man! You've passed my challenge and restored consistency to the universe once again!

Knot a problem, ok!
Knot Man

Issue #3

By Daniel Mathews
Priscilla Brown

On a sunny day in Professor Licorish's Knot Theory class sits our hero, Theodore J. Knot... for Knot Theory waits for no man.

And so you see, all non-satellite non-torus knots have a complement that can be visualised as a tessellation of a fundamental domain in...

Professor Licorish may be a world authority on the topic, but this doesn't make things any easier for our hero.

Yes, he actually has a theorem about that.

Maths destruction!

Things are never dull for long in the Knot Theory class... trained as they are to deal with any topological emergency.

Time for another emergency! Coffee break, Professor!

No! This can only mean one thing... weapons of maths destruction!

And sure enough, roaming the streets of our fair city was a crazed physicist, armed with an incredible new weapon...

The mathematicians broke for coffee... as they do whenever confronted with a difficult problem.

Tessellation ray, Professor Licorish!

Yes, they say that tessellative forces run through the universe, taking single objects and forming patterns around it hundreds of times.

You see, originally there was only one cell in a honey comb, and only four roads in the whole of Melbourne!

Run!... It's a tessellation ray!

...But now, thanks to the tessellative forces of the universe, honey can be produced in large quantities.

...And Melbourne is such an easy city to get around!

Meanwhile, no open neighbourhood of the city was safe from the onslaught.

My name is Dr Unununuu! Beware, for I will tessellate you!

Of course!
IT MUST BE THAT EVIL PHYSICIST FROM LATTASCHIN, DR... UNUNUNU!

DR UNUNU... WHO?

IF HE'S NOT A DOCTOR THEN WHAT'S HIS TITLE...

I KNEW THOSE PHYSICISTS COULDN'T BE TRUSTED WITH GROUP THEORY!

SOMEONE MUST HAVE HARNESSED THESE TESSELLATIVE FORCES FOR THE POWER OF EVIL... IN A TESSELLATION GUN!

I'LL BET HE HAS A GREAT BATHROOM FLOOR WHOEVER HE IS!

WITH THE CITY HELPLESS BEFORE IMPENDING DOOM, THEODORE J. KNOT TAKES CHARGE...

THIS SOUNDS LIKE A JOB FOR...

GO WITH A MOUTHFUL OF HIGH ENERGY TOROIDAL DONUTS AND HIS TOPOLOGICAL UTILITY BELT, THEODORE J. KNOT BECOMES...

WAIT KNOT MAN! I'M COMING TOO!

BUT PROFESSOR, IT'S A KNOTTY SITUATION OUT THERE... ARE YOU SURE?

KEEP YOUR KNICKERS IN AN UNKNOT KNOT MAN! I HAVE A FEW THEOREMS UP MY SLEEVE, YOU KNOW... WELL IT'S A TOUCH ASSIGNMENT CAN I GET PARTIAL CREDIT DO YOU THINK?

AND SO THE INTREPID MATHEMATICAL ADVENTURERS SET OFF...

...DOWN SWANSTON STREET, OF COURSE, A SHORT STROLL FROM THE CITY.

MORE ELEGANT THAN THE FUNDAMENTAL THEOREM OF GALOIS THEORY... \[ \Gamma \leq \text{Gal}(\mathbb{C}/L) \]

MORE CAFFEINATED THAN A CONVOY OF LONG-HAUL TRUCK DRIVERS

MORE POISED THAN A STABLE 2-CYCLE...

MORE INTELLIGENT THAN TEN MILLION LEADERSHIP ADMINISTRATIONS OF THE U.S.A. ...

THE TWO EVENTUALLY ARRIVE IN THE CITY, BUT DR UNUNUNU IS NOWHERE TO BE SEEN...

WHAT CAN WE DO ABOUT ALL THIS TESSELLATION?

ACTUALLY KNOT MAN, I'VE GOT SOMETHING MORE UNBELIEVABLE THAN THE BANACH-TARSKI THEOREM!

WITH MY NEW GROUP ACTION ORBIT QUOTIENT IDENTIFIER, WE CAN IDENTIFY ALL ORBITS UNDER THE ACTION OF THE WALLPAPER GROUP TO A SINGLE POINT! ...

IT ALL SOUNDS A BIT TOO MUCH LIKE A GROUP THEORY LECTURE FOR KNOT MAN.

MMMM... Z... Z...

NO KNOT MAN, IT'S NOT \( \mathbb{Z}_2 \), WALLPAPER GROUPS ARE MORE COMPLICATED!
Sure enough the professor soon discovers the correct group, and the group action orbit quotient does the rest!

The city is returned to normal...well almost...

Faster than a quantum computer, dr. unununu heads for the maths department.

Boohahaha...with the mathematicians tessellated, I will have more power than a Taylor series!

Quick professor! It's unununu-he's getting away!

Professor Luckorish performs his world famous Luckorish twist and dodges the ray...

You know I have a theorem about this!

Knotman and the professor take the emergency teleporter back to the university...

And people think there are just emergency telephones!

Look out!

Take this prof!

Refuge is found in a little known nook of the department filled with mathematical junk.

Lucky, there's a coffee machine here, eh prof?

Yes, amazing for such a compact space!

Things are looking as hopeless as the Goldbach conjecture when knotman stumbles on something...

Aha! Polygons! Now I'm ready to take on unununu!

Good luck knotman, and may the tessellative forces of the universe be with you!
Knot Man faces Dr Unununun in the corridor...

Knot Man, give up now... you have your back to the wallpaper!

NEVER, unununun!

Then prepare to be tesselated!

The rectangle absorbs the blast, falls to the floor, and creates a rather aesthetically pleasing tiling.

90 may be a factor of 360, unununun, but 108 isn't!

Unununun fires to save himself from the incoming pentagon...

AARGH!

Knot man, you've saved the day again! I thought we were as lost as Erdős looking for his own house!

Knot at all, prof!

Knot man, master of the tesselative forces of the universe!

In ensuing geometrical mayhem, unununun is reduced...

... to a harmless quotient orbifold.

... and the pentagon is distorted beyond recognition and lands in the outside courtyard, tesselated badly.
Theodore J. Knot's friend Bill is once more telling him of his latest wild philosophical speculations... just like the complex numbers... not real! or... no... the quaternions! I think I need a coffee.

Theodore J. returns with his much needed caffeine supplement. more overwhelming than a dominating map!

Bill... are you alright?

But try as Theodore J. knot might, he could not bring Bill to his senses...

You haven't been trying to tie 4-dimensional knots again, have you?
But all at once a darkly clad man bursts into the room... maybe you need a coffee...

Quick, we've got to go... he was too close to the truth!

The next thing they know, the two mathematicians are in a strange place filled with advanced technology...

Woah! Imagine how many digits of pi these could calculate!

WOW! I knew matrices were ugly but not that dangerous!

It's not looking good... he has lost his identity... his "I"... his...

How is he infinity?

If Bill loses his identity, so will our whole group! Then we'll be nothing... only a semi...

We've got to get it back! Only then will you and Bill be able to fulfill the prophecy, bring the planets back into alignment and create world peace!

Theodore J. My name is Möbius. I came to rescue you because you are essential to the survival of mankind. Your friend was under attack by agents of the Matrix!
We've got to look for clues!

Wait! There's a glitch in the Matrix!

You're right! That 3 should be a 2!

No, Knotman! Agents are coming!

Oh no! Nobody has ever defeated a matrix of agents before!

Mobius and Infinity launch themselves courageously into the fray...

Pow! Eigen!

Bang!

Speedier than a row reduction algorithm...

More cunning than the Cayley-Hamilton theorem.

Level-headed as a trace under conjugation...

More charming than a who's who of trigonometric identities.

You must conjugate them!

Of course! It's as simple as Jordan normal form. Quick, Mobius, Infinity, take these matrices!
Surely enough, the agents were diagnosed and dispersed along various eigenvectors!

Good work, Knot Man! Now let's find Bill's identity matrix!

Through a door, and they find themselves in a chamber, confronted by a rather pompous character. The Architect!

Reality Blah Fate Equation Blah Blah Free Will Blah Blah.

Oh no! This gun's philosophical mumbo jumbo is worse than an aristute!

Knot Man has a suitable reply to this dubious question.

But in special matrices, the determinant is always the one!

But then, previous versions of the matrix failed. Why?

With the Architect dazed and confused by his own nonsense, Knot Man sprints to the door... to whatever the Architect is guarding...

Who are you?

I am the one. A multiplicative identity?

The one.

You look like Keanu Reeves to me...

Look! We won!

The one!

Whonon?

The one.

One won?!

Mr. The One, can you put the Is back in Bill's identity matrix?

It is done.

Parts on dude! ?!

Bill's identity is returned...

... And back to reality

Thanks a knot!

Time for us to take a coordinate chart home!

Knot man! Master of the matrix!

Hmmm... I just had the strangest dream...

\[
\begin{bmatrix} 4 & 2 \\ 2 & 7 \end{bmatrix} \cdot \begin{bmatrix} 2 \\ 2 \end{bmatrix} = \begin{bmatrix} 2 \\ 2 \end{bmatrix}
\]
\[ \text{Re}(\bigcirc) = \bigcirc \]
\[ \text{Im}(\bigcirc) = \cdots \]
\[ \nabla \times (\bigcirc) = \smiley \]
\[ \nabla (\bigcirc) = \smiley \]
\[ \int \bigcirc -1 d\bigcirc = \text{log } \]
\[ \sup(\bigcirc) = \text{cup } \]
\[ \sin(\bigcirc) = \text{line } \]
\[ \partial(\bigcirc) = \text{line } \]
\[ \bigcirc -1 = \bigcirc \]
\[ \bigcirc 2 = \text{cube } \]
\[ \bigcirc 3 = \text{cube } \]