

229 Comments



Add a comment...



@Mathologer 1 day ago

This time, I was really looking forward to testing YouTube's new auto-dubbing feature, which translates videos into other languages. Unfortunately, YouTube relies on its flawed auto-generated English subtitles for this process, rather than using my carefully crafted subtitles. As a result, the auto-dubbed German and French audio tracks were unusable and had to be discarded. Hopefully, YouTube will address this issue in the future. Fingers crossed!

Show less

93 Reply

• 18 replies



@Kram1032 1 day ago

I'm glad that you know these languages good enough to tell, because I've seen so so many botched translated subtitles or even overdubs lately and I hate it.

8 Reply



@Mathologer 1 day ago

[@Kram1032](#) Well, there is one new (well just noticed it) feature that's not bad. As a viewer, when you select my set of subtitles you then can then also ask Youtube to auto-translate based on that set of subtitles.

11 Reply



@Kram1032 1 day ago



👍 1 💬 ❤️ Reply



@jenniferofholliston5426 1 day ago

Your office is a children's toy shop of dreams!



👍 2 💬 📌❤️ Reply



@PC_Simo 1 day ago

@Mathologer Based on the thumbnail, I thought this was a Numberphile-video; and then, based on the intro, I thought Brady had, finally, gotten You, as a guest. 😊



👍 5 💬 📌❤️ Reply



@hardrocklobsterroll395 1 day ago

Useless AI strikes again



👍 4 💬 📌❤️ Reply



@CheckmateSurvivor 1 day ago

Please use your maths skills to solve my latest puzzle.



👍 1 💬 ❤️ Reply



@isabelflorencio 1 day ago

I also hoped that this video was already in Spanish, especially because of how complex and subtle it becomes at times.



See original (Translated by Google)

👍 1 💬 📌❤️ Reply



@observing7312 1 day ago

I honestly do not see any value in this auto dubbing approach. The voice is very distracting....



👍 1 💬 📌❤️ Reply



@Mathologer 1 day ago

@isabelflorencio Try this: choose my subtitles in the player menu and then choose Autotranslate into the language you are interested in. The resulting subtitles are usually quite good :)



👍 💬 ❤️ Reply



@Mathologer 1 day ago

@observing7312 Actually I do not mind the way in which autodubbing adds the voice. Youtube just needs to give me some control over what is being said :)



👍 💬 ❤️ Reply



@almendratilkouatl 23 hours ago





2 Reply



@notahotshot 21 hours ago

@almendratlilkouatl You'll be missed 😞

1 Reply



@almendratlilkouatl 21 hours ago

@notahotshot idk if it was sarcasm but thanks

Reply



@Mathologer 20 hours ago

@almendratlilkouatl I'll keep experimenting with this feature. No harm switching it on if what's produced there is of decent quality (currently it's garbage). In the end, it's up to the viewer to decide whether something like this helps or hinders :)

Reply



@almendratlilkouatl 20 hours ago (edited)

@Mathologer yeah but when you're trying to clean dishes and you found a good video on the big SMARTV and then it starts in another language that you know but floppy and IA and you have your hands wet and you need to use a frieking small controller to painstakingly navigate the options to turn off that AUTO feature it is not like my choice, you already made the choice for me, if I could, like you said, turn A DUB feature (not an Auto one) in a turkish video that I wouldnt otherwise understand, that'd be a feature, but shoving IA voices in my throat, I take that as an insult

Show less

1 Reply



@Mathologer 16 hours ago

@almendratlilkouatl Definitely, just like subtitles, all the dubbed stuff has to stay opt-in.

Reply



@wyattstevens8574 5 hours ago

Sometime would you make a video on trilinear coordinates? I don't see too much about it on YT, but they would come in handy if rewatching the Fibonacci vs Pythagoras video and trying to follow along. The 5 centers (and the vertices) all have relatively simple coordinates there, but translating them to/from Cartesian coordinates is the hard part!

Show less

Reply



@SherriMSDRML-qm1pe 7 hours ago

Thank you thank you 🤖 🧠 🇨🇪 🇨🇪 🇨🇪 🇨🇪 🇨🇪 🌍 ❤️ ❤️ ❤️ ❤️ 💡 ⏳ 🐎 🧑



1 hours ago



love that great collection ❤️

Show less



Reply



@Novastar.SaberCombat 4 hours ago



There are some interesting geometric, lattice-like, hexagonal patterns when it comes to wavelengths, yes. Reflection is key.



"Before I start, I must see my end. Destination known, my mind's journey now begins. Upon my chariot, heart and soul's fate revealed. In time, all points converge; hope's strength resteeled. But to earn final peace at the universe's endless refrain, we must see all in nothingness... before we start again."



--Diamond Dragons (series)

Show less



Reply



@Darrida 10 hours ago



The first analogy when I saw this toy was DNA spiral illustrations from famous book Developmental Biology by Gilbert



Reply



@PC_Simo 15 hours ago (edited)



10:50 I like the small stellated dodecahedron the best, too; because it's literally the 3D-analogue of the standard 5-pointed star. So, it's fitting. The close 2nd would be the Wolfram Alpha -star, just because it's Wolfram Alpha. 🌲 😊 👍



3



Reply



@Gdnxiagn 11 hours ago



Dear Mathologer,

I have watched almost all of your video's, and also this one. But today I watched again the video about the cube formula which they didn't teach for over 500 years.

And in that (rather old video) you promised that you would also come with a really insane (it was a promise) video about Galois Theory.

I must admit that over time I have forgotten about this, but yes, now I remember again that after that video I waited for this video for a couple of months. In vain,

My very polite, although maybe off topic here, to you is: could you please keep your promise and make that really insane video you promised? I have been waiting long enough now and I think that Galois theory is very very very interesting.

I thank you in advance and wish you a happy new year (and in the Julian Calendar) also a merry Christmas.



Reply



@PetraKann 15 hours ago

Helicones are therapeutic 😊



Reply



@SandipChitale 1 day ago

This definitely has connection to the video "Why do prime numbers make these spirals? | Dirichlet's theorem and pi approximations" on 3Blue1Brown channel.



1



Reply



@DavidMFChapman 17 hours ago

If one suspends a pendulum from the bottom of an identical pendulum, one gets a double pendulum. The double pendulum has two modes of vibration whose frequencies are related by the Golden Ratio.



Reply



• 4 replies



@Mathologer

16 hours ago



Did you notice my collection of double and triple pendulums as the camera pans across my office at the beginning?



Reply



@DavidMFChapman 16 hours ago

@Mathologer I did not! But I went back and found them :) Are they chaotic?



Reply



@Mathologer

16 hours ago



Very much so and especially the triple pendulum has a much more vicious motion than I've ever seen anywhere else. I should really make a video about these pendulums. So much fun.



1



Reply



@DavidMFChapman 16 hours ago

@Mathologer I would very much enjoy that! I became interested in chaos in 1985 when I was invited to present at a conference I would not normally attend. There was nothing much in my field of acoustics so I picked the chaos session.



Reply



@franciskisner920 1 day ago

I am fascinated by the growth spirals such as the sunflower. Your graphics are a great help in understanding how the spirals develop. One idea that I didn't notice in your presentation is





another very good video and Happy New Year in which ever calendar you choose.

Show less

Reply



@foo0815 15 hours ago (edited)

9:30 6 colors don't make a mess since 6 is the product of two Fibonacci numbers, the structure is quite obvious. But 7 colors are really a mess!

Reply

• 1 reply

@Mathologer 15 hours ago

As I said ...

Reply



@ИмяФамилия-е7рби 19 hours ago

0:11

Among any number of objects, she will always be most attracted to the one in which she can see her reflection.

Reply

1 reply

@ИмяФамилия-е7рби 19 hours ago

I remembered how I once had a parrot, and he spent most of his time admiring himself in the mirror and singing songs to himself.

But this parrot was a boy. And his girlfriend only occasionally looked in the mirror, but, not finding anything interesting in her reflection, continued to do her own thing....

Read more

Reply



@obiwanpez 1 day ago

20:43 - Pairs of angles whose sum is 360 are "explementary". Students looked that one up for me a decade ago, when I said there must be a word for it.

3 Reply

• 2 replies

@Mathologer 1 day ago

Correct terminology but useless if you actually want people to understand what you are talking about :)

2 Reply



Reply



@Rai_Te 16 hours ago

(belatedly) Merry Christmas and a Happy New Year... and (currently) a nice year 2025.

See original (Translated by Google)



Reply



@PC_Simo 1 day ago

Based on the thumbnail, I thought this was a Numberphile-video; and then, based on the intro, I thought Brady had, finally, gotten You, as a guest. 😊



80



Reply

^ 10 replies



@graf_paper 1 day ago

I totally thought the same thing!!!!



8



Reply



@graf_paper 1 day ago

Can this happen?!?



7



Reply



@ultracreador 1 day ago

Exactamente, yo también creí lo mismo 😊

Translate to English



4



Reply



@PC_Simo 1 day ago

@ I'm hopeful 🍀👍.



4



Reply



@Qermaq 1 day ago

A bit of a surprise here too, and the way M-Jr introduced it was like how Brady might do it.



2



Reply



@gcewing 1 day ago

Welcome to Matholophile!



3



Reply



@tylerduncan5908 22 hours ago

@Qermaq maybe it's foreshadowing.



3



Reply



2 Reply



@rubeno71 12 hours ago

I thought exactly the same

2 Reply



@wyattstevens8574 5 hours ago

[@ultracreador](#) Yo también!

Translate to English

Reply



@robin1826 11 hours ago

Wow! Incredible! Thanks for sharing this. Love the helicone Christmas trees, and the 'microscope' is amazing!

Reply



@1.4142 21 hours ago

i would pay to go there

Reply



@ValkyRiver 1 day ago

11:00 Aw... I wanna dance...

Show less

1 Reply

• 2 replies



@PolDellaiera 15 hours ago

.618 is indeed the fractional part of the golden ratio, but it is also its invert: $1/\phi$

Reply



@pierreabbat6157 1 day ago

Not to be confused with the plant Heliconia.

Reply



@BryanLu0 1 day ago

30:32 looks like you have pi there

Reply



@jerrr-c-squared 15 hours ago



👍 ✓ ❤️ Reply



@jimiwills 1 day ago

Very reminiscent of 3b1b's prime spirals video ❤️

👍 💬 📌❤️ Reply



@jwangosho 1 day ago

The German star is cool.

👍 💬 📌❤️ Reply



@sohampine7304 22 hours ago

Missed you and your videos a lot, what a brilliant video this is! 😊😊😊

👍 1 💬 📌❤️ Reply

^ 📌 • 1 reply

📌 @Mathologer 21 hours ago

Glad you liked it :)

👍 💬 ❤️ Reply



@appybane8481 23 hours ago

43:13 I can't distinguish 6 and upside-down 9

👍 💬 📌❤️ Reply

^ 📌 • 1 reply

📌 @Mathologer 21 hours ago

You should be able to based on what I say :)

👍 💬 ❤️ Reply



@jyotsanabenpanchal7271 21 hours ago

Just 😬

👍 💬 📌❤️ Reply



@jakobr_ 1 day ago (edited)

44:58 Puzzle solution!

In the case where there's just one of each number, what matters for making spirals is how close each number gets to zero, the starting point. Since zero happens once every one revolution, we can think about multiplying the angle .618revolutions by the integer in question, and taking the result mod 1. The closer to zero, the better the spiral.



or 1 (and its "opposite 0" point).

- 0.618 is closer to 1
- 1.236 is closer to 1
- 1.854 is closer to 0=2
- 3.090 is closer to 1=3

Now this next part isn't rigorous at all but it gives a rough justification. If all of these fibonacci numbers end up "picking a side", same or opposite, and are close enough to that side that the rounding error doesn't build up enough to flip to the other side, we can just treat their angles like they are fully 0 or 1 (with 2 being a full revolution). Then by the fibonacci sequence's defining rule, we can get the next one by adding the previous two. Opposite + opposite = same, opposite + same = opposite, same + opposite = opposite, repeat.

And this ends up working because the fibonacci sequence are increasingly good denominators for fraction approximations of this angle, and so the angles of the points corresponding to these numbers are guaranteed to get closer to either zero, and the rule holds.

Opposite Opposite Same, repeat.

When there are three of each number, let's name them -1, 0, and 1.

- The first multiple of .618 is close to 1
 - The second is close to 1
 - The third is close to 2=-1 mod 3
 - The fourth is close to 3=0 mod 3
 - The fifth is close to 5=-1 mod 3
- From here the fibonacci procedure takes over

1,1,-1,0,-1,-1,1,0,1,1,-1,0,-1,-1,1,0

A cycle of 8. (When building each arm of these triple spirals, always either stick to the same original orientation (0) or cycle through the three options forward or backward (1, -1))

In general just look at what the fibonacci numbers are mod any integer.

Show less

1 Reply

• 1 reply

@Mathologer 1 day ago

Very good :)

1 Reply



@ultracreador 1 day ago

10:25 OMG Es el Rhombic Hexeconhedron

Translate to English



1 reply



@Mathologer 1 day ago

Yes, Wolfram's Spikey is indeed the Rhombic Hexecontahedron :)



Reply



@moonlightcocktail 1 day ago

Very cool!

I wonder if we can have an office tour sometime



Reply



• 1 reply



@Mathologer 1 day ago

New year's resolution: Keep myself sane by doing a couple of hands-on maths videos that don't take 100 hours each to produce. At least some of these will be set in my office :)



Reply



@Qermaq 1 day ago (edited)

I find it interesting that to approximate $\sqrt{2}$, start with something close like a/b , and then find $(a + 2b)/(a + b)$. This yields $1, 3/2, 7/5, 17/12$, etc. all the best-so-far approximations. $\sqrt{3}$ is the same, but $(a + 3b)/(a + b)$ and we get $1, 2, 5/3, 7/4, 19/11, 26/15$ etc. But for $\sqrt{5}$, $(a + 5b)/(a + b)$ won't do it. We need to add an a to the top and a b to the bottom, so ...

Read more



1



Reply



2 replies



@catmacopter8545 23 hours ago

look up "continued fractions"! I think you might find your answer there :)



2



Reply



@santerisatama5409 21 hours ago

To add to catmacopter's answer, I find the continued fractions represented as zigzag paths in Stern-Brocot tree the most intuitive way to think about continued fractions. That said, Dirichlechts theorem for $a+2b$ of coprimes a/b is also very special.

The case 5 is deeply connected with quintic polynomials and Abel-Ruffini theorem. The close association of $\sqrt{5}$ with golden section means that in the Stern-Brocot tree the Fibonacci-fraction paths are some kinds of limits of recursion. When we apply Dirichecht(2) to Fibonacci fraction pairs a/b and b/a and $a/b > 1/1$, then $a+2b$ gives Lucas numbers and $b+2a$ gives Fibonacci numbers. Two by two for any hyperoperation level gives always 4, two by two is the only constant arithmetic operation in that sense, and doesn't go beyond 4 to 5 etc. for any operation.

Show less



hours ago (edited)



your assistant is about as good on the eyes as the golden ratio is on nature.
also, can u do a collab with either Veritasium or 3B1B?

Reply

• 1 reply

@Mathologer 16 hours ago

I let Karl know :)

1 Reply



@gali01992 1 day ago

Reminds me of something similar that I did back when I was in high school (1973). The school district had an HP2000F computer that the students were allowed to use. One of the devices hooked up to the computer was a plotter with 8 pen colors. I wrote a Spirograph program in Basic that plotted the most amazing and colorful designs given a list of ...

Read more

4 Reply

• 1 reply

@Mathologer 1 day ago

Very similar to what I remember from my first exposure to computers in highschool. Programming the computer in BASIC to print a dragon curve on a matrix printer by sticking together lots and lots of quarter circles :)

1 Reply



@otisheggem8103 18 hours ago

Wow

Reply



@whatthefunction9140 20 hours ago

Looking more and more like a farnsworth

1 Reply

• 1 reply

@Mathologer 20 hours ago

:)

Reply



@andrewpatterson5479 14 hours ago (edited)



...maximally equal in area. In doing so, one ends up with a regular pentagon with the ...

Read more



Reply



@mattymoowhite 18 hours ago

dear mathologer, how about a video on the mathematics behind those racks of balls with a growing length of string attaching the balls to the horizontal pole where they are set swinging in phase but due to their progression of period by virtue of their progression of pendulum length they become out of phase , creating decreasing numbers of sets of balls i...

Read more



Reply



• 1 reply



@Mathologer 16 hours ago

I actually know exactly what you mean. I've actually got two of those in my office :) That and many of the hundreds of other gadgets in my office would be worth featuring in separate videos.



Reply



@peterflom6878 1 day ago

I'm amazed by how you consistently produce such interesting videos.



18



Reply



• 1 reply



@Mathologer 1 day ago

Glad you enjoy them!



Reply



@gabor6259 1 day ago

Some of the dots don't connect to any other dots. Why is that?



Reply



• 1 reply



@Mathologer 1 day ago

Glitch in the my program that I never bothered to fix :)



Reply



@ikocheratcr 1 day ago



Reply

• 1 reply

@Mathologer 1 day ago

That's what I am after :)

Reply



@BryanLu0 1 day ago

Looks like you have pi instead of 355/133 [30:32](#)

Reply

• 2 replies

@Mathologer 1 day ago

Yep, I always show the first couple of digits of pi and highlight those that also that appear in the approximation.

Reply

@BryanLu0 1 day ago

@Mathologer Oh, I got confused by what you said. I thought you were showing the fraction

Reply



@pierreabbat6157 1 day ago

17 looks interesting on the microscope; it's half of 34.

1 Reply



@NotBroihon 17 hours ago

Why am I not surprised by all the crazy things in your office lmao

Reply



@iurikroth2281 1 day ago

666/212 is a good way to approximate pi

Reply

• 1 reply

@Mathologer 1 day ago

I'd never say no to anything with a 666 in it :)

Reply



Reply



@frankharr9466 19 hours ago

I like that. Thank you.



Should I put that golden angle in my app?

...

Read more

Reply

• 1 reply

@Mathologer 16 hours ago

What app?



Reply



@santerisatama5409 22 hours ago

Most enjoyable, thanks!



Here is where I really went WOW to the exponent phi:

Fractions 22/7 and 333/106 give the mediant 355/113 with mediant addition $(a+c)/(b+d)$...

Read more

Reply

• 1 reply

@Mathologer 20 hours ago

"Fractions 22/7 and 333/106 give the mediant 355/113 with mediant addition $(a+c)/(b+d)$ from the coprime fractions a/b and c/d " Definitely not a coincidence and as you say the deeper reason is to be found in the intersection of continued fractions, Farey sequences, and the Stern-Brocot tree.



1 Reply



@typha 1 day ago

the sequence of best rational approximations of pi at 37:17 is missing some things. The denominators should be the sequence A063673 in the OEIS.



Reply

• 6 replies

@Mathologer 1 day ago

You are looking at the wrong entry. This is the correct one <https://oeis.org/A002486>



1 Reply



A02486 is explicitly only those rational approximations given by truncated continued fractions (apart from the first 2 terms). In the video what is described is the sequence of best rational approximations so far as the denominator is increased. For example 19/6 is the best you can do with a denominator less than 7. As described it should be included.

This is a problem with the onscreen visuals and not with the script.

Show less

3 Reply



@gabor6259 1 day ago

@typha Burkard said that every approximation with the denominator 8 is worse than with the denominator 7. So I assume 3.5; 3.333; 3.25; etc. were not included because there's a better approximation with the next number.

1 Reply



@typha 1 day ago

@gabor6259 I had considered that, however there would still be numbers missing, for instance 179/57 and 201/64.

But also I felt that it seemed a little arbitrary to exclude the 'best so far' ...

Read more

Reply



@santerisatama5409 22 hours ago

@Mathologer From quick look, to my understanding A002486 gives the convergents when the zigzag path in Stern-Brocot tree changes direction from L to R or from R to L. The full list of convergents is computed for each n times L and n times R step of the path, not just the changes of direction (which is how the standard numerical representations of continued fractions are given). Decimal number representation is not necessarily the most accurate metric, as (now just intuitively guessing) different bases can give different degrees of accuracy per strings in various bases. I assume that's been studied already, and with a search we could get the answer.

Show less

Reply



@Mathologer 16 hours ago

Actually, you are right. Painted myself in a corner there.

Reply



@muskyoxes 1 day ago

I think the official motto of math is "and so on"

Reply



... a lot of math is about detecting patterns and once you've pinned one down it's "and so on" :)

Reply



@sirius6066 20 hours ago (edited)

36:20 A correction: You don't have to go 106 to find a better approximation. The next one that is better than 22/7 is 179/57. In fact there is 6 more between them. They are: 201/64, 223/71, 245/78, 267/85, 289/92, 311/99.

2 Reply

• 2 replies

@Mathologer 16 hours ago

Sadly, you are right there :(

1 Reply



@SummerHoneyClock 14 hours ago (edited)

@Mathologer Thanks for a great video.... I also think 13/4, 16/5 and 19/6 should be in there. BTW, I've been too busy finishing my first iPhone app to watch your videos for a few months, and it's been a real treat catching up on all of them now I have time!

Reply



@catmacropter8545 23 hours ago

If im remembering correctly, your traditional Moravian star is the final stellation of the icosahedron!

Reply

• 1 reply

@Mathologer 21 hours ago

Actually no it comes from putting spikes on the faces of the Rhombicuboctahedron https://en.wikipedia.org/wiki/Moravian_star

Reply



@Drachenbauer 1 day ago

i would color the star at the top of the christmas tree yellow.

Reply



@pippotopazio2400 19 hours ago

where I can find the sw used in first part of video?

Reply



```

If you've got access to Mathematica you can run this piece code (just copy and paste
and execute) Manipulate[
Module[{f, pw, cylinders, colors, adjustedColors, centerCylinders,
  base, spokes, coreSphere, viewpoint, alpha,
  beta},(*Function to define the shape of the cylinders based on the \
index t*)f[t_] := (32 - t) t/256 + 0.4;
(*Piecewise function to determine the position offset*)
pw[i_] :=
Piecewise[{{0, x < 0}, {x, i >= x >= 0}, {i, 35 >= x > i}, {i - x,
  36 + i > x >= 35}, {0, x > 36 + i}}];
(*Generate a dynamic color palette*)
colors = Table[ColorData["Rainbow"][i/numColors], {i, 1, numColors}];
(*Adjust color intensity dynamically*)
adjustedColors =
Table[Blend[{colors[[i]], White}, colorIntensity], {i,
  Length[colors]}];
(*Compute the twist factor from the angle*)
beta = (Pi twistAngle/180) + 0.098174;
(*Compute alpha from the input angle*)alpha = Pi alphaAngle/180;
(*Create the cylinders in the spiral structure*)
cylinders =
Table[{adjustedColors[[Mod[i, Length[adjustedColors], 1]]],
  Cylinder[{{f[i] Cos[alpha i + beta (pw[i] /. {x -> range})],
    f[i] Sin[alpha i + beta (pw[i] /. {x -> range})]},
    spacing i}, {f[i] Cos[
  alpha i + beta (pw[i] /. {x -> range})],
  f[i] Sin[alpha i + beta (pw[i] /. {x -> range})]},
  spacing i + cylheight}}, radius]}~Join~
If[showSecondCylinders, {Cylinder[{{-f[i] Cos[
  alpha i + beta (pw[i] /. {x -> range})], -f[i] Sin[
  alpha i + beta (pw[i] /. {x -> range})]},
  spacing i}, {-f[i] Cos[
  alpha i + beta (pw[i] /. {x -> range})], -f[i] Sin[
  alpha i + beta (pw[i] /. {x -> range})]},
  spacing i + cylheight}}, radius]}, {}, {i, 1, numLayers}];
(*Create the center cylinders*)
centerCylinders =
Table[Cylinder[{{0, 0, spacing i + cylheight/2}, {0, 0,
  spacing (i + 1) - cylheight/2}}, cylheight/cc], {i, 1,
  numLayers}];
(*Define the base of the structure*)
base = {Gray,
  Cylinder[{{0, 0, spacing*-1}, {0, 0, spacing*(numLayers + 1)}},
  0.1];
(*Create the spokes of the structure if enabled*)
spokes =
If[showSpokes,
  Table[{adjustedColors[[Mod[i, Length[adjustedColors], 1]]],
    Style[Cylinder[{{f[i] Cos[

```



```

cylinder[2], {-f[i] Cos[
alpha i + beta (pw[i] /. {x -> range}), -f[i] Sin[
alpha i + beta (pw[i] /. {x -> range})],
spacing i + cylinder[2]], cylinder[cc], EdgeForm[]], {i,
1, numLayers}], {}];
(*Create the core ellipsoid if enabled and color it gray*)
coreSphere =
If[showCore, {Gray,
Ellipsoid[{0, 0, 16 spacing}, {1.2, 1.2, 1.2*1.5}], {}];
(*Determine the viewpoint based on the selection*)
viewpoint =
Switch[viewOption,
"Current View", {20, 20 Cos[1.5 Pi/2], 20 Sin[1.5 Pi/2]},
"Top View", {0, 0, 50}, "Side View", {0, 50, 0}];
(*Create the 3D graphics with all components*)
Graphics3D[
Join[cylinders, centerCylinders, {base}, spokes, {coreSphere}],
Boxed -> False, ViewPoint -> viewpoint,
PlotRange -> {{-1.76, 1.76}, {-1.76, 1.76}, {0, 4}},
ImageSize -> 750, Lighting -> "Neutral", Axes -> False]],

(*Add the interactive controls*)
Item[Style["Growth Controls", Bold, 16, Black], Alignment -> Left],
{{alphaAngle, -5.62,
Style["Divergence angle 1", FontSize -> 14]}, -10, 0, .1},
{{range, 32.59, Style["Lolipopter movement", FontSize -> 14]}, 0, 68,
0.0005},
{{twistAngle, 68.75388202501892,
Style["Divergence angle 2", FontSize -> 14]}, 0, 360,
Appearance -> {"Open"}},

Delimiter,
Item[Style["Action controls", Bold, 16, Black], Alignment -> Left],
{{numLayers, 31, Style["Number of layers", FontSize -> 14]}, 1, 31,
1, Appearance -> {"Labeled"}},
{{numColors, 5, Style["Number of colors", FontSize -> 14]}, {1, 2, 3,
4, 5, 6, 7, 8, 9, 10, 11, 12, 13}, SetterBar},
{{viewOption, "Current View",
Style["Viewpoint", FontSize -> 14]}, {"Current View", "Top View",
"Side View"}},

Delimiter,
Item[Style["On off", Bold, 16, Black], Alignment -> Left],
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{{showSpokes, True, Style["Spokes", FontSize -> 14]}, {True,
False}},
{{showSecondCylinders, True,
Style["Second leaf", FontSize -> 14]}, {True, False}},

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lheight, 0.064, Style["Cylinder height", FontSize -> 14]}, 0.05, 1},
 {{spacing, 0.116, Style["Layer spacing", FontSize -> 14]}, 0.05, 1},
 {{cc, 2, Style["Spokes radius", FontSize -> 14]}, 1, 20, 1},
 {{colorIntensity, 0, Style["Color Intensity", FontSize -> 14]}, 0, 1}}

Show less

👍 1 💬 ❤️ Reply



@Nikolas_Davis 1 day ago

An office worthy of a true Wizard of Oz 🤪

👍 4 💬 📩❤️ Reply



@happyvirus6590 1 day ago

6:32 They really looked like spinning

👍 3 💬 📩❤️ Reply



@TheMichaelmorad 1 day ago (edited)

I am waiting for a link to this mathematica program to play around with it!

👍 1 💬 📩❤️ Reply

📩 • 1 reply



@juzbecoz 19 hours ago

Mathologer dropped after Drake's freestyle .
Drake is quiet.

👍 2 💬 📩❤️ Reply



@seav80 1 day ago

I think the most relevant and related Numberphile video is this one featuring Ben Sparks:
<https://www.youtube.com/watch?v=sj8Sg8qnjOg>

👍 💬 📩❤️ Reply



@MAREKROESEL 1 day ago

What was the motivation to see 0,618 as a tractional part of phi and not 1/phi. What would inverted pi look like in the microscope? Somehow reading it as an inverted value would seem more natural...

👍 4 💬 ❤️ Reply

📩 • 5 replies

@BryanLu0 1 day ago



Read more

Translate to English

2 Reply



@phyphor 1 day ago

I came here to ask the same thing as every time 0.618... was mentioned as the "fractional part of phi" I was thinking it's "phi^-1"

2 Reply



@Mathologer 1 day ago

Yes, $\phi = 1.618\dots$ $1/\phi = 0.618\dots$ and so 0.618 is the fractional part of both ϕ and $1/\phi$.

3 Reply



@WK-5775 16 hours ago

I was asking myself the same question, and I felt happy with the explanation I found when the same game was being played with pi or with $\sqrt{5}$: as we are dealing with angles, twisting the next layer by $3.1415\dots \times 360^\circ$ amounts exactly to the same as twisting by $0.1415 \times 360^\circ$. Thus the integer part simply doesn't matter.

Read more

Reply



@MAREKROESEL 7 hours ago

Thanks. As one always see the period in radians, somehow I missed we "express" PI in degrees.

Reply



@sngash 1 day ago

Very nice 🍷

Reply

• 1 reply



@Mathologer 1 day ago

Glad you enjoyed it!

Reply



@TomFarrell-p9z 1 day ago

I once had a dream that I'd died and went to my just mathematical reward. The attendant told me my job was to solve all integrals, in terms of analytic solutions when possible, and in terms of infinite series when necessary. It's difficult but I have all eternity to do it, he reminded me. "Yippie!" I thought. He said they were short of office space at the moment ...



• 1 reply



@Mathologer

1 day ago

:)



Reply



@EternalBooda 1 day ago

These graphs are like baby photos of Mandelbrot.



Reply



@RibbleMaths_YifanDu 1 day ago

Nice video! Thanks Mathologer ❤️



3



Reply



@walternullifidian 1 day ago

"Welcome to my parlor," said the spider to the fly. 🕷️



6



Reply



@xyz.ijk. 1 day ago

This is a really beautiful video. Thank you for all of your work over so many years. I hope you're enjoying a beautiful holiday season.



13



Reply



@fhtagnfhtagn 1 day ago

Every time I walk in the forest with my kids, we always calculate the number of spirals on the fir, cedar or pine cones. They are always two neighbor Fibonacci numbers depending on the plant kind.



2



Reply



• 2 replies



@fhtagnfhtagn 1 day ago

In contrary to coniferous trees the oak's acorn has a single Fibonacci number as a number of CW and CCW spirals (21 I think).



2



Reply



@Mathologer

1 day ago

I used to count the three visible numbers of spirals in pine apples in the local supermarket :)



Reply



Reply



@stingrayx2182 1 day ago

I don't know if YouTube can handle more than one Mathologer...



3



Reply



• 1 reply



@Mathologer

1 day ago

I think it can also handle Karl :)



Reply



@flobiish 19 hours ago

Watched the video twice. Referencing your 1=full rotation measurement. Several observations/questions:

Is this a standard measurement like radians where $2\pi = 1$ rotation or degrees where it's 360...

Read more



Reply



• 1 reply



@Mathologer

16 hours ago

"Is this a standard measurement" It's standard in terms of measuring any part of a whole. In many ways this is the most natural of doing so. "What's it called" angles as fractions of a full circle :)

"Do the organisms (like flowers, trees and pinecones) drop the whole number when they are performing the algorithm like your program". Yes.

When you go down to 10 circles, one nice spiral is all you see :)

Maybe check out the video with the Fibonacci number in the title that I mention in this video :)

Show less



Reply



@solarcrystal5494 20 hours ago

mathologer jr needs a cueball haircut



Reply



@robo0428 1 day ago

wow look at that office



ol 1 day ago



Wow, when I was studying for 15 years maths my professor in Munich shows the $\lim_{n \rightarrow \infty} \frac{f_{n+1}}{f_n} = \phi$. Now there is also PI with his fractions inside, because of getting more light for green growing 🌲 🌳



1



Reply



@charlottesimonin2551 1 day ago

How many of the Fibonacci numbers are also Prime? Do we know within some kind of ratio? Which is the smaller infinity?



Reply



• 4 replies



@Mathologer

1 day ago

I don't think we know much in this respect. However, there are a few interesting things one can say in this respect. Google "divisibility Fibonacci". Two facts, that are particularly nice are:

1. If you start the sequence like this 1,1,2,3,5,8 and let the first 1 be F_{-1} , then F_n will never be a prime if n is not a prime (the only exception being that $n=4$). In other words, a Fibonacci number that is prime will automatically have a prime index.
2. In this paper <https://www.jstor.org/stable/2689243?seq=1> Ron Graham replaces the seed numbers 1 and 1 by two special relatively prime numbers and proves that ALL terms of the resulting sequence are composite numbers!

Show less



1



Reply



@santerisatama5409 21 hours ago

Interestingly, in case of Lucas numbers, we know even less about their divisibility than of Fibonacci numbers.



Reply



@Mathologer

16 hours ago

Probably just because not as many people are interested in them as there are people interested in the Fibonacci numbers :)



Reply



@santerisatama5409 12 hours ago

[@Mathologer](#) Honestly, I don't think it's just about interest. It's so far just intuitive hunch without anything like a full chain of deduction that would come even close to a proof, but I've stumbled on some pre-numeric fairly simple formal language stuff involving reversibility vs. non-reversibility that might also somehow connect with the Riemann hypothesis. The story, as far as I've stumbled on it, is too long to share here, but it involves $a+2b$ and $b+2a$ as well as $a/(b-1)$ and $b/(a-1)$ from coprimes $a/b...$ and other Stern-Brocot related stuff.

Show less



alOracleOfManyWorlds 1 day ago

what the fractional digits of Euler's number, e?

3 likes, 1 comment, 1 heart, Reply

5 replies



@Mathologer 1 day ago

Check it our yourself using this app
<https://demonstrations.wolfram.com/PhyllotaxisExplained/>

1 like, 1 comment, 1 heart, Reply



@PrimordialOracleOfManyWorlds 1 day ago

@Mathologer tyvm.

Translate to English

1 like, 1 comment, 1 heart, Reply



@santerisatama5409 21 hours ago

Check out also the continued fraction of e. It's periodic!

1 like, 1 comment, 1 heart, Reply



@Mathologer 16 hours ago

Yes a real beauty that infinite fraction. Actually on my to do list to cover in detail :)

2 likes, 1 comment, 1 heart, Reply



@santerisatama5409 12 hours ago

@Mathologer Can't wait. :)

1 like, 1 comment, 1 heart, Reply



@RabbitInAHumanWoild 1 day ago

You refer to spirals and they certainly look like that if you take the projection along the Z axis. Would it not be better to refer to them as helices even if the diameters of the helices is not constant?

1 like, 1 comment, 1 heart, Reply

1 reply



@Mathologer 1 day ago

Well a lot of people also refer to helices as 3d spirals and so I think in this video spiral is the better choice since it captures perfectly what is happening both visually and conceptually.

1 like, 1 comment, 1 heart, Reply



⌵ ↩️ 📌 Reply

^ 📌 • 1 reply

📌 @Mathologer 1 day ago

Happy Holidays!

👍 1 🗨️ ❤️ Reply



@syjwg 1 day ago

I can understand the angles between the leaves, but the distance between them, and in what rate it is increasing?

👍 🗨️ 📌 Reply

^ 📌 • 1 reply

📌 @Mathologer 1 day ago

In terms of the distance of the leaves/circles from the center, at all times there also is a constant difference between consecutive circles.

👍 🗨️ ❤️ Reply



@rickostidich 1 day ago

Hurray, my Christmas present finally arrived!! Thanks Burkard, happy holidays! 🧡🎉

👍 4 🗨️ 📌 Reply



@willemvandebeek 1 day ago

Best wishes for the new year, professor Burkard & entourage.

👍 2 🗨️ 📌 Reply



@AnubhabKamar 1 day ago (edited)

Please make a video on the topic for which the Abel prize 2024 had been awarded ..

👍 2 🗨️ 📌 Reply



@AbhayPratapSinghRajawat-ch4uz 1 day ago (edited)

just incredible ,a new dimension to think .GOOD JOB MATHOLOGER

👍 2 🗨️ 📌 Reply



@istariknight1 1 day ago

I was just rewatching your previous videos yesterday! What a treat to get a new one on Saturday morning, Happy 2025

👍 2 🗨️ 📌 Reply



Copy 2025

👍 1 💬 ❤️ Reply



@danceswithardvarks3284 1 day ago

What limits the spirals of your helicone toys when you spin them please?

👍 1 💬 📌❤️ Reply

^ 📌 • 2 replies



@Mathologer 1 day ago

Each level features a groove and a pin protruding from the top. The pin from one layer fits into the groove of the next layer, restricting the rotation of the two layers to a specific angle relative to each other.

👍 2 💬 📌❤️ Reply



@danceswithardvarks3284 1 day ago

@Mathologer Thanks/

👍 💬 📌❤️ Reply



@NoobsDeSroobs 1 day ago

I really wished you would have made small incremental changes to the divergence angle.

👍 1 💬 📌❤️ Reply

^ 📌 • 1 reply



@Mathologer 1 day ago

You can play with this animation
<https://demonstrations.wolfram.com/PhyllotaxisExplained/>

👍 2 💬 ❤️ Reply



@musicalBurr 1 day ago

I LOVE your Christmas tree!!

👍 3 💬 📌❤️ Reply

^ 📌 • 2 replies



@Mathologer 1 day ago

I hope somebody actually rises to my challenge and builds this one in real life :)

👍 💬 ❤️ Reply



@lunafoxfire 1 day ago

@Mathologer my first thought was "i want to do that with an actual tree!" don't think i will have time this year but i will keep it in mind for next year!



room 23 hours ago (edited)



What? you used the golden rule to make the helicone. It is not surprizing that it would contain golden ratios. Of course it does. Am I missing something. It is not hiding in, it is built with?



Reply



• 1 reply



@Mathologer

20 hours ago

Think of the helicone or any pineconelike plant as an object you find "in the wild". What I describe here is a journey of discovery from scratch during which you discover nature's numbers.



1



Reply



@malixaron 1 day ago

wow more people!



Reply



@danceswithardvarks3284 1 day ago

Fantastic Video. I had spent the start of December making (on a wood lathe) myself a mathematicians Christmas tree with clear acrylic baubles holding the platonic solids as well as a rhombic dodecahedron, a stellated octahedron and an excavated dodecahedron. These are hanging from an acrylic plate in following an Archimedian spiral. BUT a Helicone tree ...

Read more



2



Reply



• 1 reply



@Mathologer

1 day ago

Sounds great. Send me some photos :) burkard.polster@monash.edu



1



Reply



@justluke0001 1 day ago

the pine cone at 2:49 looks AI generated



Reply



• 1 reply



@Mathologer

1 day ago

It isn't :)



Reply



Reply



@fburton8 1 day ago

A veritable Aladdin's playroom... math fun to the max! 😊



1



Reply



• 1 reply



@Mathologer 1 day ago



Yes, thousands of maths toys and gadgets :)



Reply



@sunnyboy4553 1 day ago

This sounds SO SO SO fantastic. Can't watch now, put saved it in my GREAT!!! bookmark. Thank you so much and all the best in the new year.



1



Reply



@sc4freak 1 day ago

Is that the same Mathologer Jr. from <https://youtu.be/DfnBW6HvNwM?t=631>? Surely not, all grown up! 😭



Reply



• 1 reply



@Mathologer 1 day ago



The one and only :)



Reply



@kingtime2109 1 day ago

This is a great vedio



Reply



• 1 reply



@Mathologer 1 day ago



Glad you liked it!



Reply



@GaryFerrao 1 day ago

I thought Brady went back to Australia and you were in a Numberphile video lol. New format for 2025 with fewer animations?



Reply



Reply



@vapormermaid 1 day ago

31:05 Does this mean that math heaven is Chinese?



Reply



@Sky9Magic 1 day ago

this is so cool



3



Reply



@oldschoolsoldier1634 1 day ago

This is for sure a fun toy to tinker with :) Say that Galois theory video? still in the works?



1



Reply



@msolec2000 1 day ago

At 14:58 you skipped over 29, which is also quite spirally... what's going on here? :)



1



Reply



• 1 reply



@Mathologer

1 day ago



Well, spotted. Intuitively, for a spirally spiral to pop out in the microscope means that it's "pretty straight" and therefore we can expect it to yield a better approximations than a "spiral abomination". But then, even among the spirally spirals the straighter the better and the spiral corresponding to 29 really twists a lot from the get go. Sort of ...

Read more



2



Reply



@sunnyboy4553 1 day ago

Can I buy this device?? How much is it???



1



Reply



• 4 replies



@Mathologer

1 day ago



Pretty sure Amazon sells it.



Reply



@fhtagnfhtagn 1 day ago

@Mathologer there got to be 3d models available for 3d-printing this nice thing!



1



Reply



...smooth otherwise the twisting motion will grind to a halt before the pinecone has
...ned.

Reply



@sunnyboy4553 10 hours ago

[@Mathologer](#) Thank you, but I'm looking to buy a 3D model, if they exist. Fascinating.

Reply



@hankseda 1 day ago

Good to see you in 2025! Looking forward forward to another year of numbers intrigue and colorful presentations 🎉

Reply

• 1 reply



[@Mathologer](#) 1 day ago

Happy New Year, good to be back! 🙏

1 Reply



@TheIgnoramus 1 day ago

Excellent.

Reply



@twistedsim 1 day ago (edited)

Nice office!

Reply

• 1 reply



[@Mathologer](#) 1 day ago

The home of thousands of maths toys and gadgets :)

Reply



@Priyanshishukla11 1 day ago

oh i think this time i am first viber of this vedio but

Reply

• 1 reply



at the video.



Reply



@lv_john_vl 1 day ago



Junior wants to become a youtuber?



Reply



• 1 reply



@Mathologer

1 day ago



We'll see :)



1



Reply