

One Year Anniversary

28 December 2019

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It is hard to believe a whole year has passed since I started this blog. What is even more surprising is that by February I thought I was about done. I had more or less uploaded the math curiosities and problems I had been thinking about over the years and had presented most of the math essays I had written. There are of course only a finite number of math problems in the world, so I thought I was about done. But much to my surprise I kept finding one more thing that interested me, either an essay or math problem. So here I am. We will have to see what the next year brings.

What to say on this anniversary? I think I will give a retrospective about how the website has been received this past year. This is a challenge, since virtually all my visitors have been silent (which means I haven't faced criticism, but then I generally haven't received the necessary correctives either). There are ways to glean some information about visitors and I extracted what I could from the simple plugin I use to count visitors to different posts. I hear that Google analytics provides lots of details, such as the country of origin of a visitor (which would be interesting) and the like, but I have avoided Google and the other social networks as much as possible. After all, I am only an old curmudgeon with old-school notions of privacy.

I used the Igor analysis tool to assemble and display what data I was able to capture and the Appendix below (p.3) portrays the results. It turns out that there are a number of fascinating patterns, some of which I understand and some I don't. The first surprise is shown in Fig. 1 *Timeline of Daily Post Visits* (p.3). The daily total number of visits gyrates wildly from day to day, but the overall trend is a *constant 0.7 new visits per day*, that is, the linear fit has a stable constant slope of 0.7. This has held steady for months, independent of the type or number of posts or number of visitors. Weird.

Related to this is the number of new visitors per day. This takes some inference to estimate. I assume that a new visitor will relatively soon look at the About page. Since that page is rarely updated, a repeat visitor will probably not look at it again. Therefore, I am using the number of visitors to the About page as an estimate of new visitors per day (some may look at the page more than once, some may not look at all, so hopefully it averages out). As Fig. 5 *Cumulative Number of About Visits (27 Dec 2019)* (p.4) shows, since 22 July 2019 the average number of new visitors has held steady at 4 per day. Why? I don't know. Where are they coming from? How come it averages at 4? There are some day-to-day variations, but no trends that last longer than a few days, and so the overall average stays constant at 4. Weird.

As the number of posts I uploaded increased (as shown in Fig. 4 *Cumulative Number of Posts (27 Dec 2019)* (p.4), I thought a fairer measure of the number of post visits should be a normalized number. So I divided the total number of post visits in a day by the total number of postings that were on the website on that day. This gives sort of an average number of daily visits per post for all the posts, as shown in Fig. 2 (p.4). A new pattern showed up, where for the end of January each post received about a half visit per day, then for February through half of May each post received roughly one visit per day, followed by one and a half visits per day for each post from mid-May through most of September, where now we are at about one and three-quarters of a visit for each post per day.

Using these normalized numbers, I decided to investigate the daily scatter a bit more closely, that is, was there a pattern to the average daily visits per post. Sure enough, Fig. 3 *Percent Visits per Week Day* (p.4) reveals a weekly pattern. If visitors were reading posts randomly throughout the week, I would expect $1/7 \approx 14.3\%$ of the week's visits to occur on each day of the week (represented by the horizontal red line in the figure), but that is not the case. After 48 weeks of data Thursday seems to be the most preferred day to visit the website and Friday the least (except for yesterday which had 641 visits, mostly at the Circular Rendezvous post inexplicably), with Wednesday a close second. What gives? What is so special about Thursday in the week? Weird!

Now I turn to the individual posts themselves. With no comments I could not easily tell which posts garnered interest and which didn't. So I began to take snapshots of the post visits at intervals of one or two weeks. (My plugin did not retain the cumulative daily visit numbers for each day, or at least make them available to me, so I had to capture them by hand when they occurred.) I plotted the latest snapshot as shown in Fig. 6 *Most Recent Snapshot of Cumulative Post Visit Counts* (p.5). To see the effect of the various post categories, I color-coded them as described in the figure legend. It turned out that there did not seem to be any particular preference by category.

There is a falling red dotted line in the figure which represents the cumulative average daily visits (from Fig. 2) expected for a post versus its posting date. Since the blue dots in Fig. 2 represent an average number of visits for *all* the posts on a given day, the older posts will have accumulated more of these average visits than newer posts and so the red dotted line slopes downward toward more recent dates. If a post remained popular, the number of actual visits it accumulated should exceed the accumulated average visits. If it lost interest, then its accumulated visits would drop behind the accumulated average.

What we see is that interest in the older posts has flagged (mostly before May), whereas interest in the newer posts is still high. There are a few dots among the older posts that remain popular (above the red line), for example the Math Commentary posts of the Meditation on Is and Angular Momentum. But how has interest in the different posts varied over time? To answer that I produced my most interesting plot, Fig. 7 *Individual Cumulative Post Visit Timelines Relative to an Average Cumulative Post Visit Timeline (Zero Line)* (p.6) where I plotted the cumulative number of visits to each post versus the snapshot date. But in order to capture the popularity idea, I plotted the residuals (differences) with respect to the accumulated average number of visits.

Here we see the Pool Party post made at the end of January achieved peak interest relative to the average number of visits in the beginning of March and then fell off steadily. The Columbus Irony post had two spurts of interest, at the beginning of May and then another at the beginning of June. The early posts of the Meditation on Is did not garner much interest until the beginning of June when they surged and maintained their interest more or less up to now. The early Angular Momentum post languished until the beginning of October when it suddenly surged, probably due to a reference from a later post. The early flagging Perspective Map post surged in the beginning of July, probably because it was referred to in the Alberti's Perspective post that was uploaded then. Two curiosities are the sustained high interest in the Tricky Product post and the exploding and increasing interest in the Math and the Essence of Life post and Circular Rendezvous post. Lots of mysteries.

In fact, one final mystery at this point is the strange, more or less shared, downward slope of postings that are losing interest relative to the average number of visits. It's not as if no one is reading the posts, in which case their slope would be the mirror image of the average visits slope. But as all the posts keep increasing in visits (the older ones are now all above 300 visits), they seem to be doing so at more or less at the same diminishing rate. I haven't figured out why that is yet.

Appendix: Meditations on Mathematics Website Visit Counter Summary

Fig. 1 Timeline of Daily Post Visits
23 Jan – 27 Dec 2019

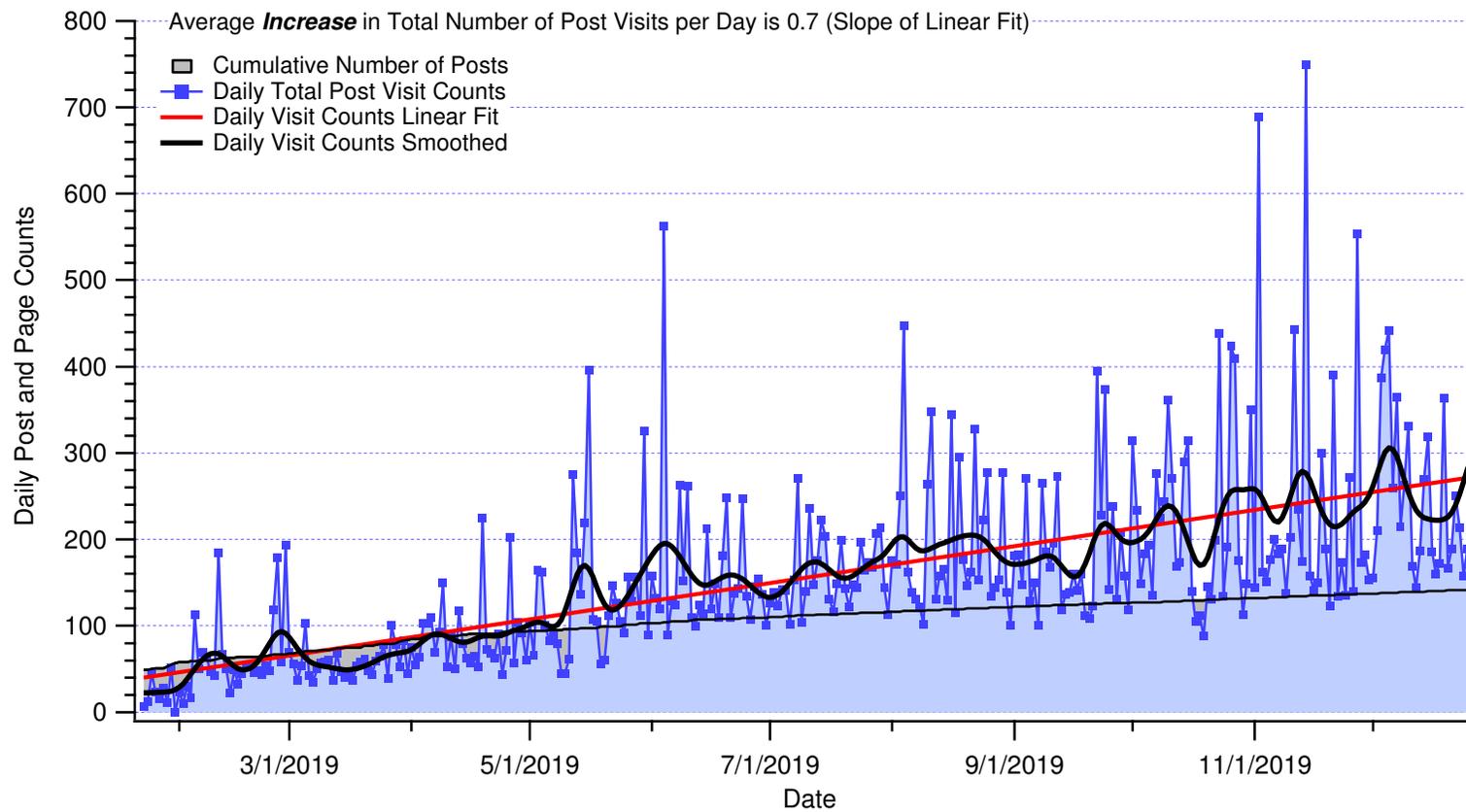


Fig. 2 Average Daily Visits per Post (Daily Total Visit Count/Cumulative Posts)(27 Dec 2019)

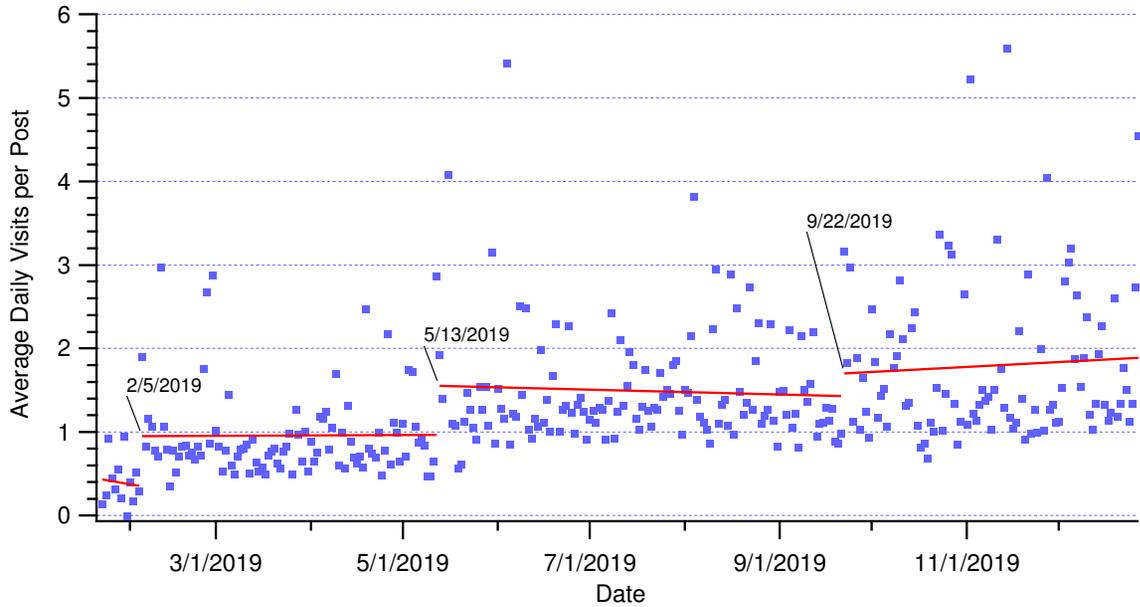


Fig. 3 Percent Visits per Week Day

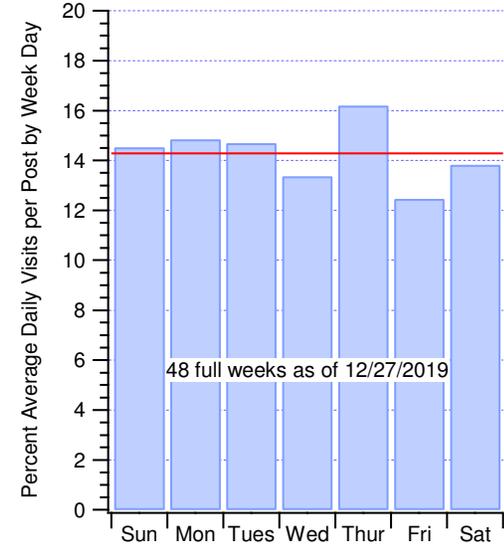


Fig. 4 Cumulative Number of Posts (27 Dec 2019)

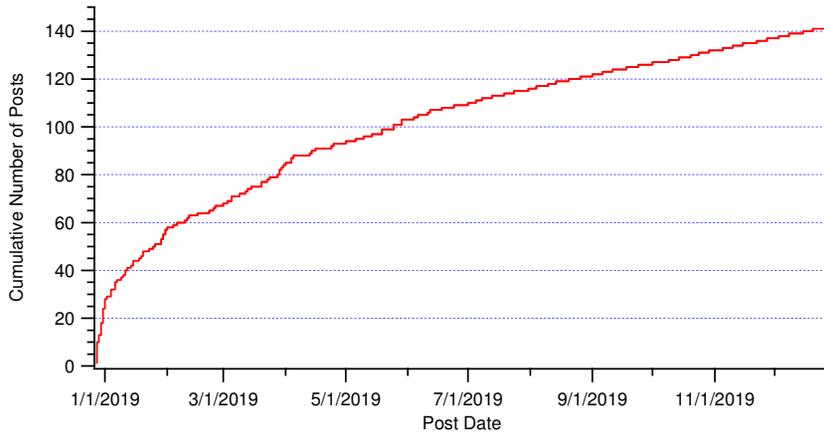


Fig. 5 Cumulative Number of About Visits (27 Dec 2019)

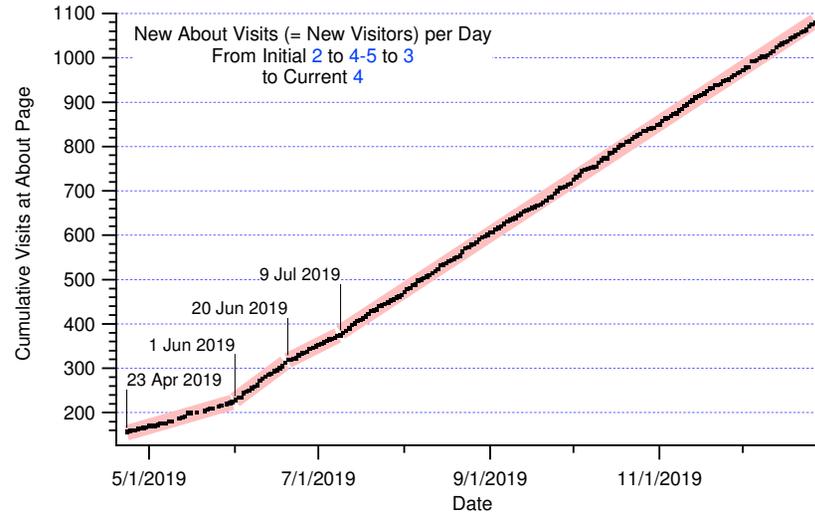
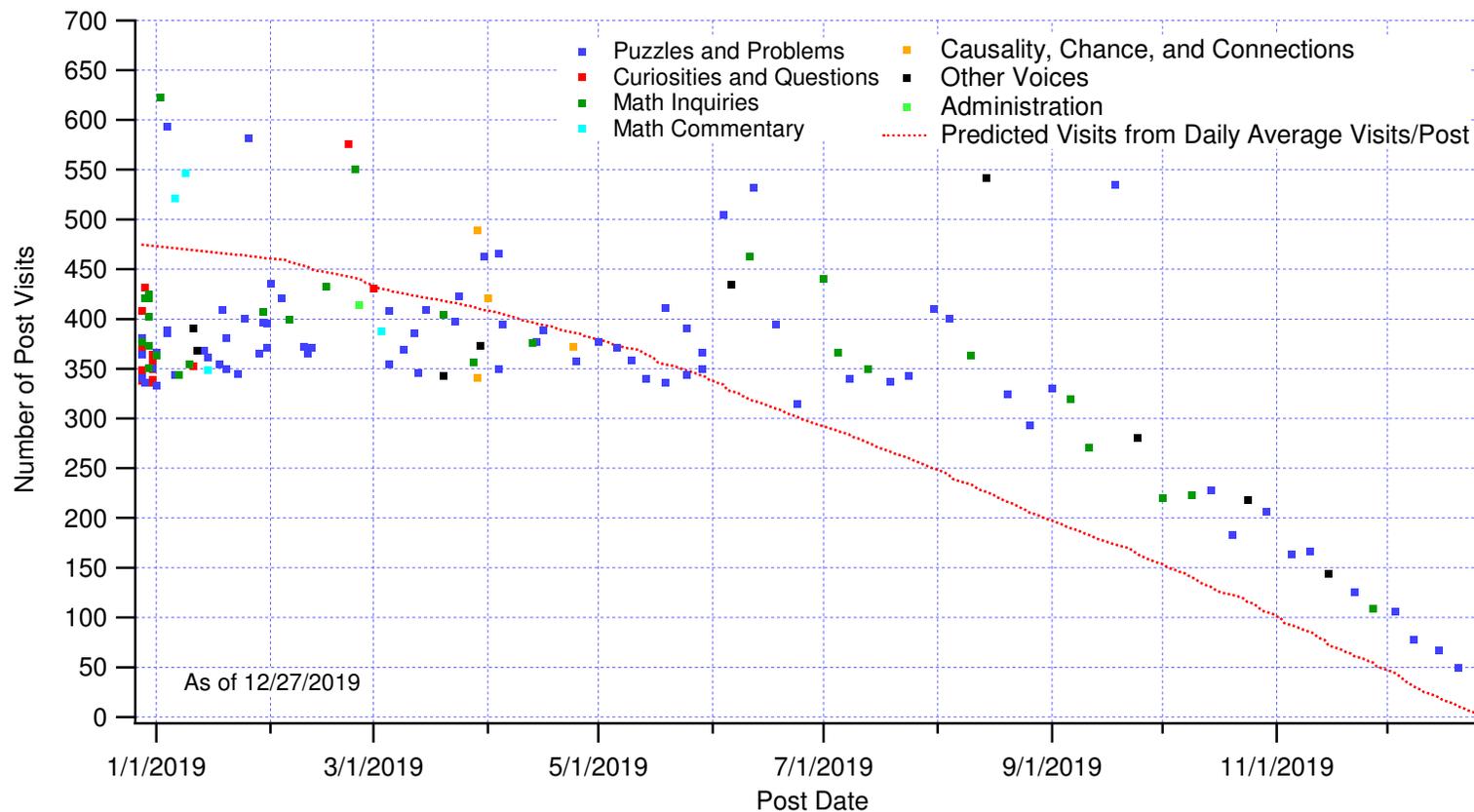


Fig. 6 Most Recent Snapshot of Cumulative Post Visit Counts

27 December 2019

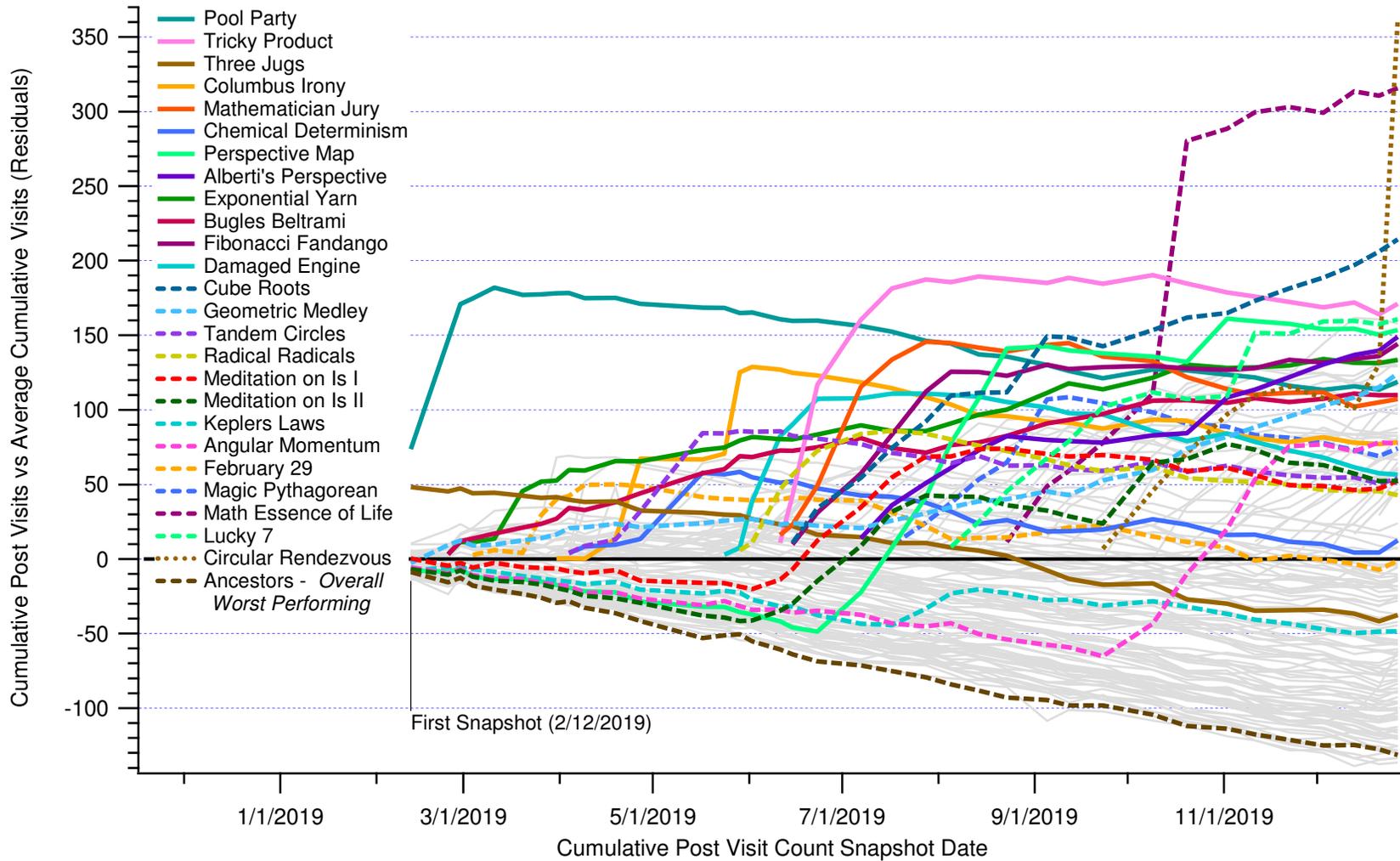


This plot represents the cumulative number of visits to each post as of the latest snapshot date. Taking the values from the “Average Daily Visits per Post” plot above, the red line shows how many accumulated visits a post should be expected to have if its post date had been at any point along the x-axis. This is a way to gauge the interest in a post. Those that fall below the red line have less than

average interest, and those above have more than average interest. For example, as of 12/27/2019, “A Tricky Product” (posted 6/4/2019) has shown more relative interest than the previous leader “Pool Party” (posted 1/26/2019), even though “Pool Party” has 582 visits and “A Tricky Product” has 505.

Fig. 7 Individual Cumulative Post Visit Timelines Relative to an Average Cumulative Post Visit Timeline (Zero Line)

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This plot gives the individual timelines of the snapshots of the Post Visit counts shown in the previous plot. Furthermore, the

difference between each cumulative Post Visit count and the cumulative average Post Visit count (shown as a dotted red line in

the previous plot) is shown instead of the raw Post Visit counts. The first snapshot occurred on 2/12/2019, which is the start of the plot. Some Posts had already been uploaded by then and had accumulated differences with the average.

There are some fascinating patterns to the timelines. The more significant ones have been highlighted in color. For example, the Perspective Map, was among the least popular until suddenly at the end of June it surged in interest. This might be attributed to interest in the Alberti's Perspective post, which was posted on 7/1/2019, a date between the snapshot dates of 6/23/2019 and 7/7/2019 where the Perspective Map showed its turnaround. But there also appears to be a burst of interest in many of the new posts, and some of the old posts, around the end of May and beginning of June. Perhaps this is due to students getting out of school for the summer vacation.

Many of the postings show a peak in interest followed by a steady decline. Some, such as the Exponential Yarn, Bugles Beltrami, and Geometric Medley show a steady or eventual increase in interest. The slopes of posts with declining interest all appear similar, which suggests a puzzle to solve. A working hypothesis might be that initially a new post garners attention from all the current visitors, after which it is only the new visitors that have an interest. So the decline is not as fast as it would be if everyone stopped reading the post, but it is faster than the average rate of reading posts.

Then, of course, is the startling rise of Math Essence of Life after 10/9/2019 and Circular Rendezvous after 12/21/2019. No explanation at this time.

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