Proposal: The Factorial Function

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It would not be a stretch to categorize my work under the topics in my 3 previous blog posts and this one. I talk about the Stirling formula:

$$n! \approx \sqrt{2\pi e}\left(\frac{n}{e}\right)^n$$

Think about it. If you don't know much math, there are only so many starting points. So no matter how complicated our analysis gets, there shold only be a few principles at play.

Here we can get away with just the trapezoid rule:

$$\log n! = \log 1 + \log 2 + \cdots + \log n$$

$$\approx \int_1^n \log x\, dx = n\log n - n$$

The goal of this project is to state and make towards specific conjectures, built from these.

This concludes my proposals for the Spring.

A My frustration with physics literature or math literature, I am unlikely to come up with observation of interest to others.[1] It's just not happening.

For one things, since my interest is about $n!$ I am maybe interested in counting things. Within combinatorics there is:

- counting things
- finding rare and exotic objects
- studying how things are connected
- words

and many other things. I am mainly focusing on the first one here. It is called **enumrative combinatorics**. There are two kinds of applications:

- counting things predicted by mathematics
- counting things related to the outside world

[1] This blog is not very goal-oriented and does not accomplish anything in particular. It is a waste of time.

I have been treating arXiv like "monkeys on a typewriter". Every day people write about different things, and I find some of them relevant.

Here is a crude explanation from social network analysis of why nothing important can happen here:

- most people have no idea what they want/need
- a few people can navigate a constantly changing, and poorly understood terrain and identify valuable opportunities resources etc
- even fewer people have the stature / seniority to affect any meaningful change in that space

Therefore, without any idea who or what or where, it starts to look like an uphill battle. **Change is slow.** More importantly, they way we decide who is good or what is important is a collective phenomenon with a few "key players".

I can even prove there aren't too many key players, because we instinctively want the best that we can find. That process happens essentially by chance.

In fact, it is a very deliberate process based on hard work!!

The factorial function appears in the Laplace transform and it's unclear what is being counted there:

$$\frac{n!}{t^{n+1}} = \int_0^\infty x^{n+1}\, e^{-tx}\, dx$$

who cares about the exponential function anyway? or the derivative? it's all just made up anyway.

References

(1) **Wikipedia** "Factorial Function" https://en.wikipedia.org/wiki/Factorial