

# Popular Math on YouTube

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## Big Questions

To be discussed in the beginning of the seminar.

- How can popular math be useful and important?

*Examples:* Showing the general public that math is valuable. Making people (especially students) interested in learning math. Inspire students to pursue degrees and careers in math. Remind math students about how awesome math is, and why they have chosen to study it.

- Why is it not done more? (A common saying is that the content of higher math is one of the world's best kept secrets...)

*Examples:* Lack of incentives. Ideas about how math has to be communicated and how popular math has to be done. The idea that higher math is "too difficult" to be explained to the general public. (Not necessarily true, since really advanced and abstract physics like quantum mechanics or relativity are very popular subjects).

- How is it done well?

*Examples:* Picking the right topic, focusing on the right things. Using metaphors, graphics, animations. Portraying the nature of math well, for example by emphasizing the creative, inventive and exploitative aspects of mathematics. Avoiding the risk of confirming prejudices/stereotypes about mathematics. Avoiding the risk of creating misconceptions by oversimplifying.

## Specific Questions

To be discussed after every particular video.

- How did the video approach the topic?
- Who is it aimed at? What are they trying to accomplish?
- What did (or didn't) we understand?

- Can anyone explain the difficult bits for others?
- Did we like this approach or not?
- What did we like (or not like) about it?
- How did the video portray mathematics as a field?
- How does it work for certain audiences inside/outside the math community?
- Where is this on a scale from 1–10?

## Examples of Youtube Videos

Examples (with hyperlinks) of videos on the (perhaps surprisingly controversial) topic “assigning finite values to obviously divergent series.”

**Adding Past Infinity** (minutephysics, 47 seconds)

“Math trolling.” Probably intended to show that “crazy” math can be useful in physics, even if it’s not entirely rigorous.

**ASTOUNDING:  $1 + 2 + 3 + 4 + 5 + \dots = -1/12$**  (Numberphile, 8 mins)

One of the most controversial instances of popular math on youtube. Has been accused of confirming the prejudice that math is just about mysterious, counter-intuitive formula manipulations. Defenders claim that it reached a lot of people and sparked a lot of engaged discussions.

**Why  $-1/12$  is a gold nugget** (Numberphile, 15 mins)

This is a newer video from Numberphile. Highlights the creative nature of math by bringing up examples from math history.

**What does it feel like to invent math?** (3blue1brown, 15 mins)

A very different approach, both with respect to the mathematical content and the way it portrays mathematics.

**Ramanujan Summation** (singingbanana, 9 mins)

A short comment on the Numberphile videos.

**Making sense of  $1+2+3+\dots = -1/12$  and Co.** (Mathologer, 34 mins)

This is an example of a much longer video on the same topic. It might be interesting to think about how this makes it qualitatively different from the others.

$$\sum_{k=0}^{\infty} (-1)^k = \frac{1}{2} \quad \sum_{k=0}^{\infty} 2^k = -1 \quad \sum_{k=1}^{\infty} k = -\frac{1}{12}$$