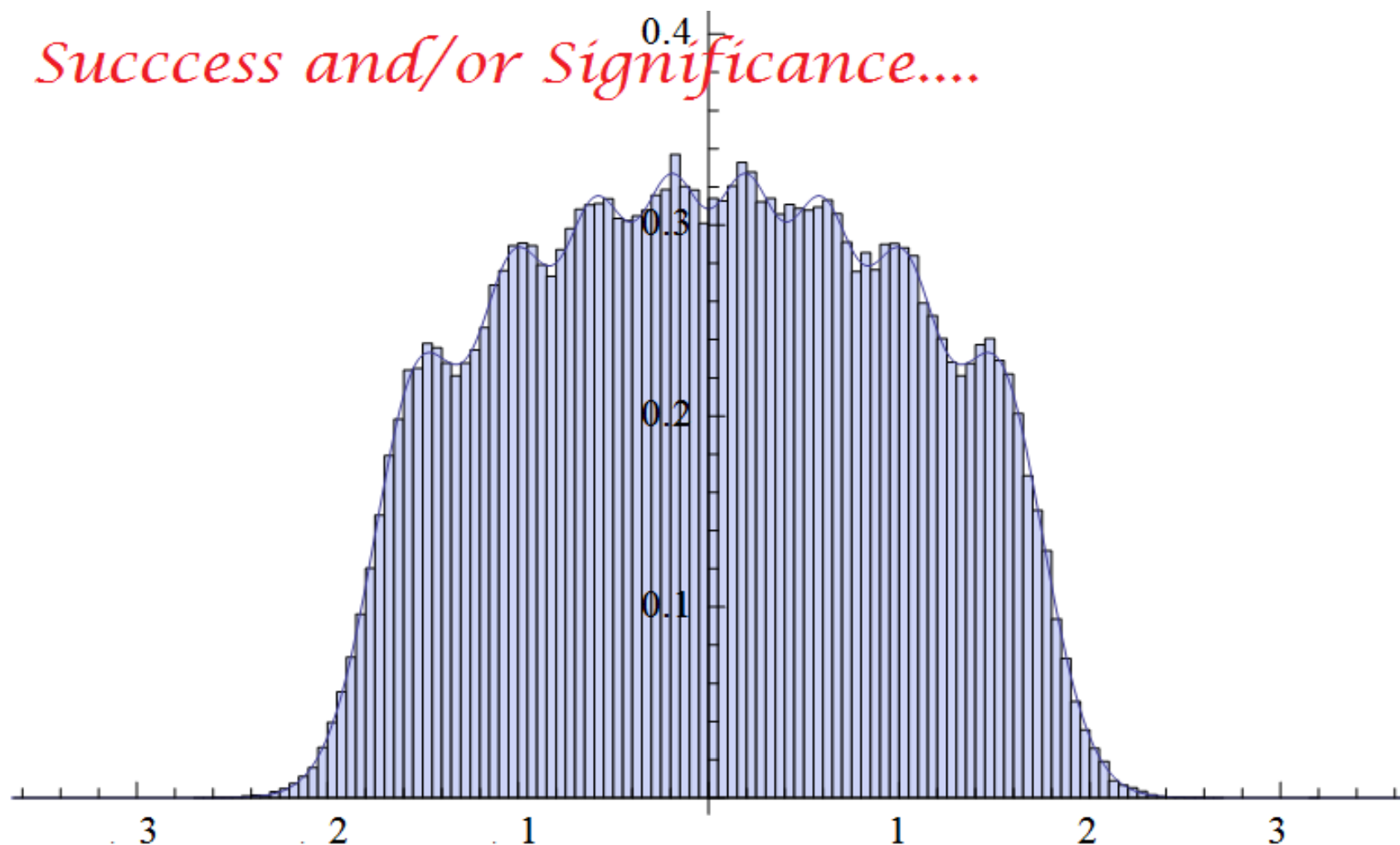


Success and/or Significance....



*a culturally Jewish mathematician's perspective
(Steven Miller, Department of Math/Stats, 7 Nisan 5776)*

Definition 1.1: Success

the accomplishment of an aim or purpose.

"the president had some **success** in restoring confidence"

synonyms: favorable outcome, successfulness, successful result, triumph; Hollywood ending

"the success of the scheme"

antonyms: failure

- the attainment of popularity or profit.

"the success of his play"

synonyms: prosperity, affluence, wealth, riches, opulence

"the trappings of success"

antonyms: poverty

- a person or thing that achieves desired aims or attains prosperity.

"I must make a success of my business"

synonyms: triumph, bestseller, blockbuster, sellout; More

- star, superstar, celebrity, big name, household name;
informal celeb, megastar

antonyms: failure, flop, nobody

- *archaic*

the outcome of an undertaking, specified as achieving or failing to achieve its aims.

"the good or ill success of their maritime enterprises"

Definition 1.2: Significance

sig·nif·i·cance

/sig'nifikəns/

noun

1. the quality of being worthy of attention; importance.

"adolescent education was felt to be a social issue of some significance"

synonyms: importance, import, consequence, seriousness, gravity, weight, magnitude, momentousness; *formal* moment

"a matter of considerable significance"

2. the meaning to be found in words or events.

"the significance of what was happening was clearer to me than to her"

synonyms: meaning, sense, signification, import, thrust, drift, gist, implication, message, essence, substance, point

"the significance of his remarks"

Narrowing the discourse

- **Success:** The accomplishment of an aim or purpose, or the person who accomplishes.
- **Significance:** Quality of being worthy of attention, meaning found in events.
 - Who judges success and significance?
 - Who determines quality?
 - Types / realms:
 - Academic / professional
 - Community
 - Personal / family
 - Spiritual

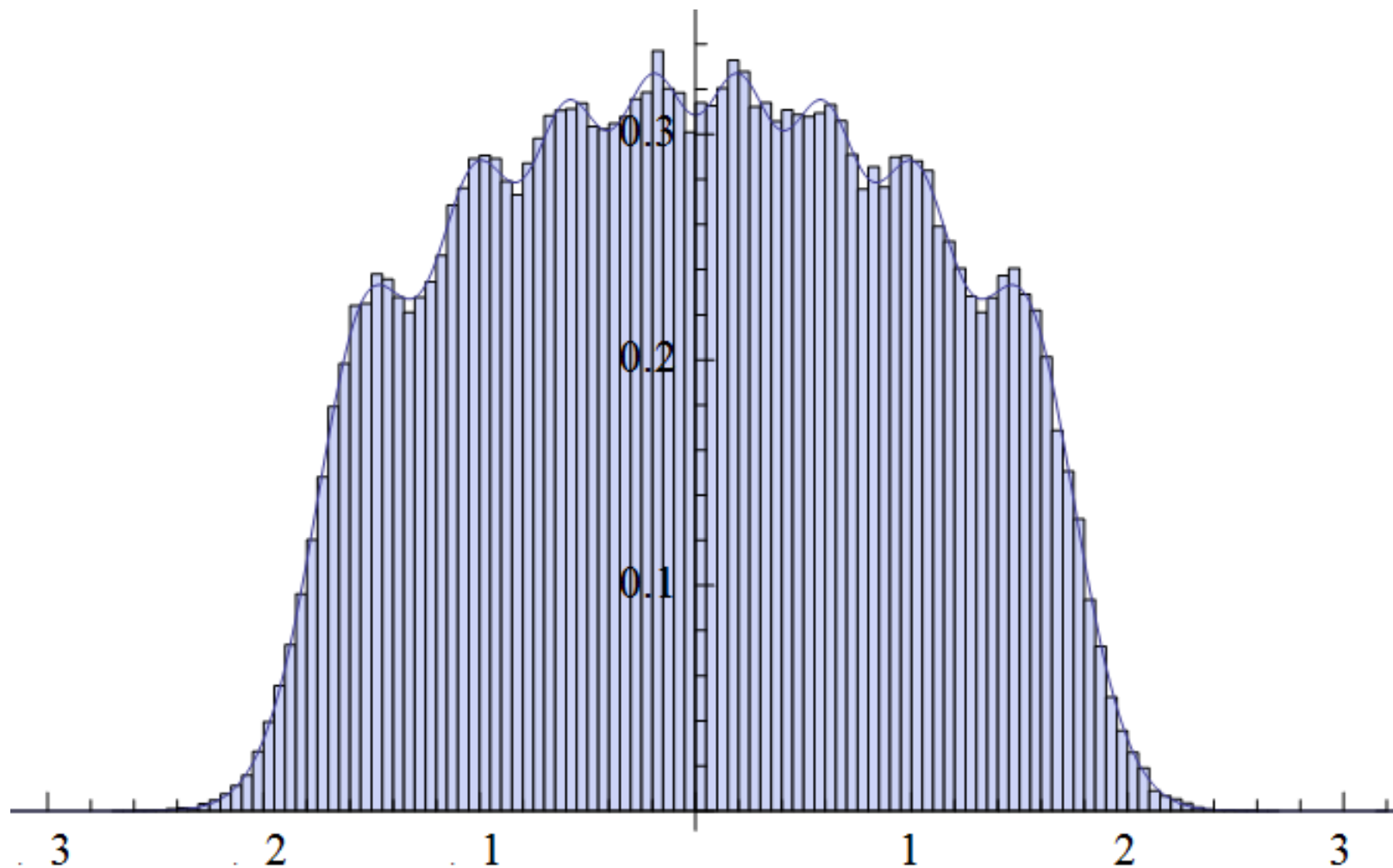
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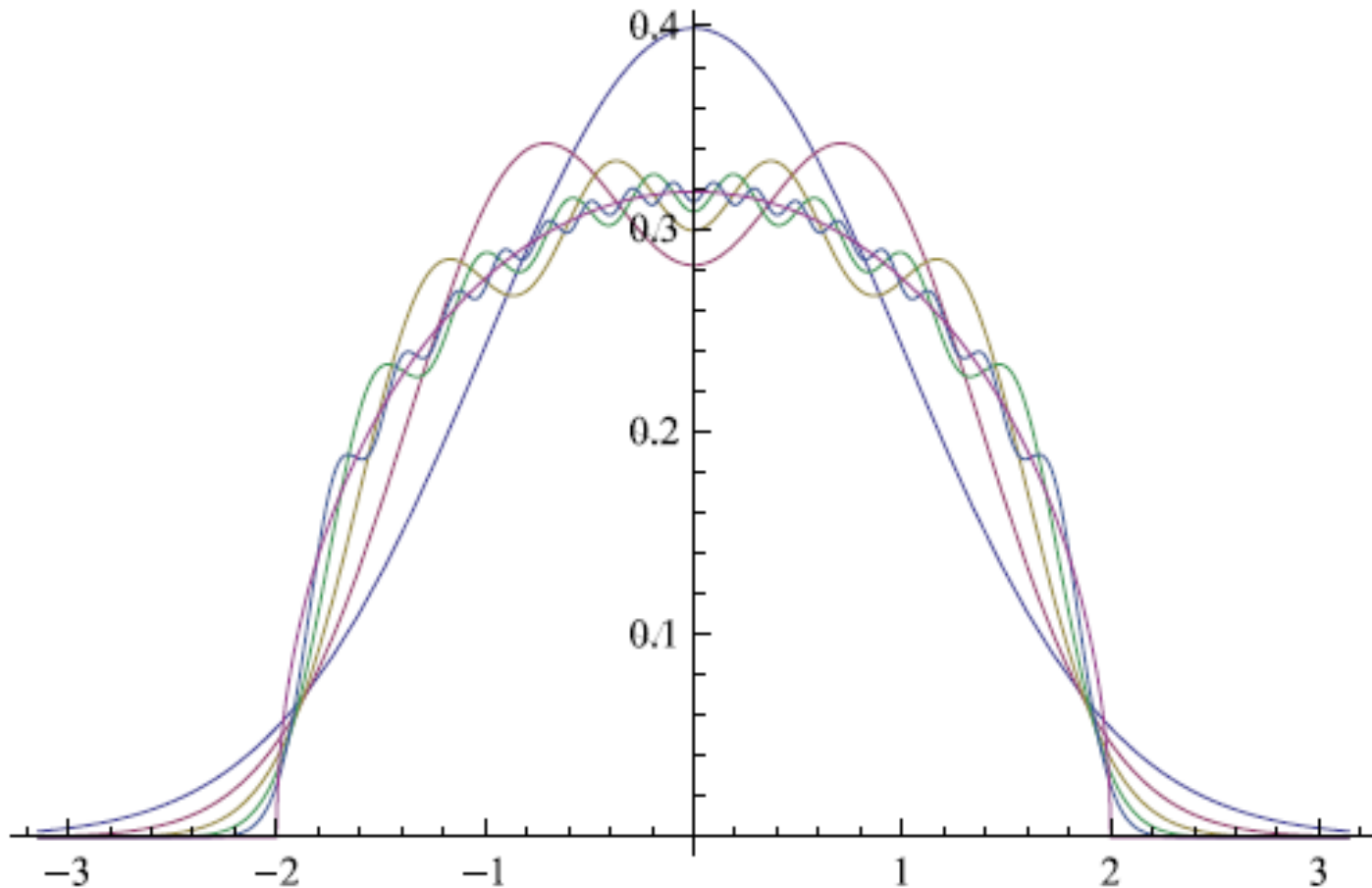
G. H. Hardy Quotes

- A chess problem is genuine mathematics, but it is in some way “trivial” mathematics. However, ingenious and intricate, however original and surprising the moves, there is something essential lacking. Chess problems are unimportant. The best mathematics is serious as well as beautiful -- “important” if you like, but the word is very ambiguous, and “serious” expresses what I mean much better.
- A mathematician ... has no material to work with but ideas, and so his patterns are likely to last longer, since ideas wear less with time than words.
- Greek mathematics is the real thing. The Greeks first spoke a language which modern mathematicians can understand... So Greek mathematics is ‘permanent’, more permanent even than Greek literature.
- I have never done anything 'useful'. No discovery of mine has made, or is likely to make, directly or indirectly, for good or ill, the least difference to the amenity of the world... Judged by all practical standards, the value of my mathematical life is nil; and outside mathematics it is trivial anyhow. I have just one chance of escaping a verdict of complete triviality, that I may be judged to have created something worth creating. And that I have created something is undeniable: the question is about its value.
- The mathematician's patterns ... must be beautiful ... Beauty is the first test; there is no permanent place in the world for ugly mathematics.

Random Matrix Theory



Random Matrix Theory

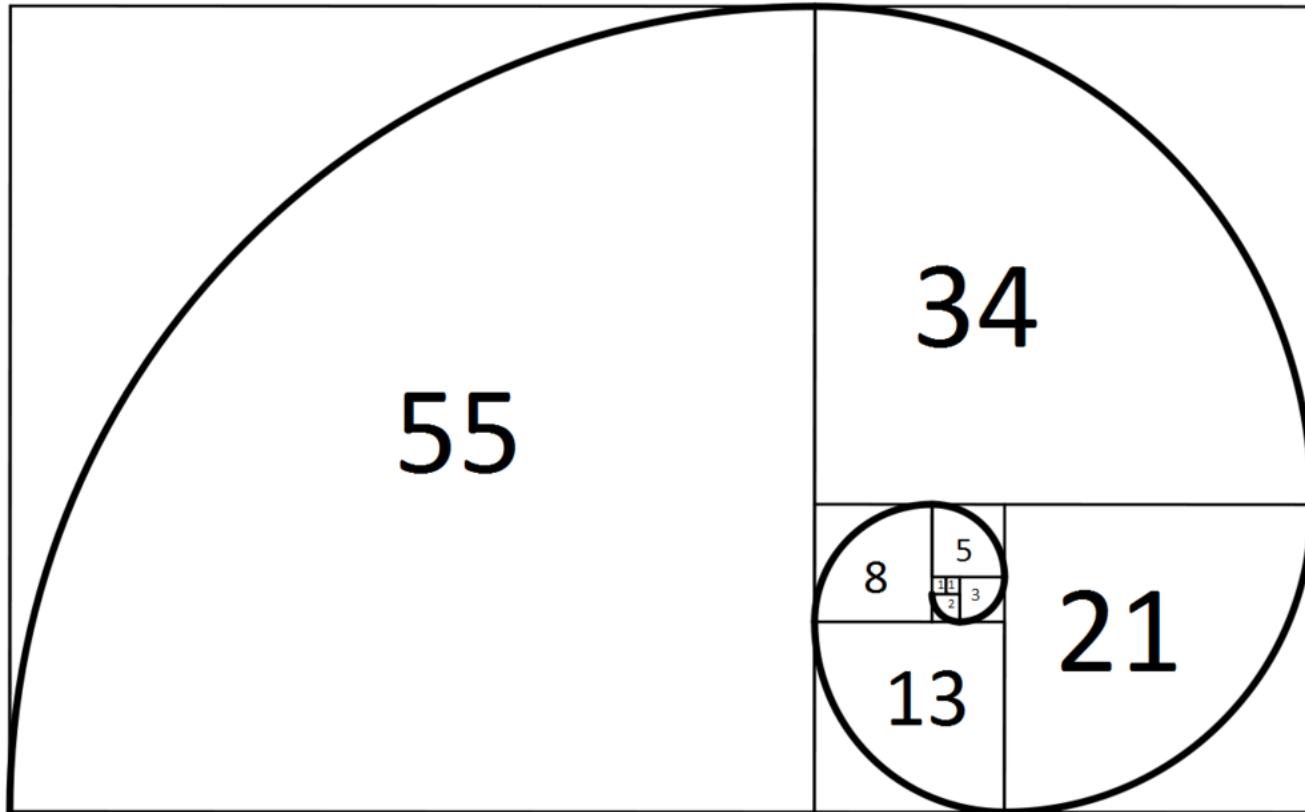


$$f_m(x) = \frac{e^{-mx^2/2}}{\sqrt{2\pi m}} \sum_{r=0}^{m-1} \frac{1}{(2r)!} \left(\sum_{s=0}^{m-r} \binom{m}{r+s+1} \frac{(2r+2s)!}{(r+s)!s!} \left(-\frac{1}{2}\right)^s \right) (mx^2)^r$$

Fibonacci: 0, 1, 1, 2, 3, 5, 8, 13,

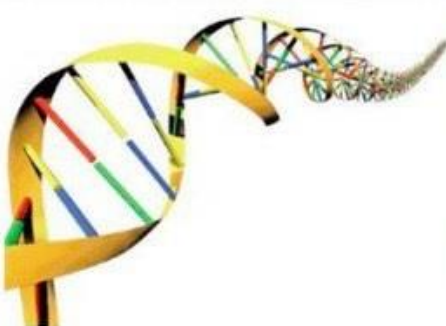
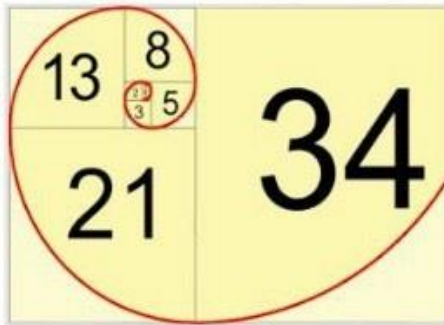


Fibonacci Spiral



$$F_1^2 + F_2^2 + \dots + F_n^2 = F_n F_{n+1}$$

Fibonacci Spiral

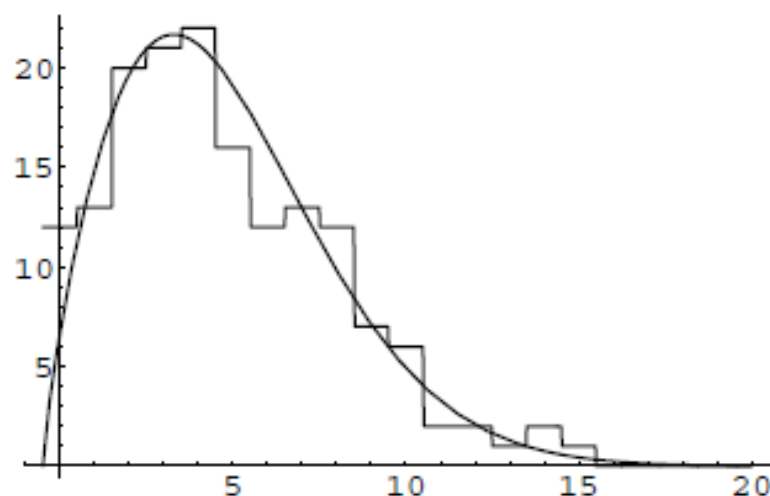
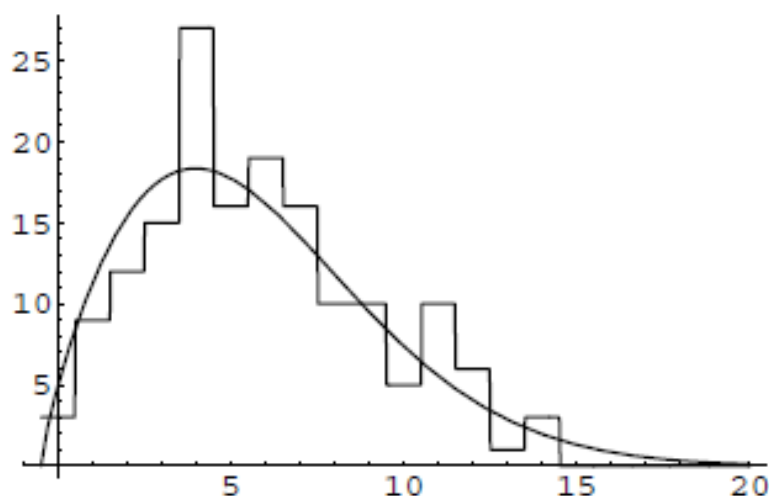


<https://www.youtube.com/watch?v=kkGeOWYOFoA>

Applied Mathematics

$$f(x; \alpha, \beta, \gamma) = \begin{cases} \frac{\gamma}{\alpha} \left(\frac{x-\beta}{\alpha} \right)^{\gamma-1} e^{-((x-\beta)/\alpha)^\gamma} & \text{if } x \geq \beta \\ 0 & \text{otherwise.} \end{cases}$$

Plots of RS (predicted vs observed) and RA (predicted vs observed) for the Boston Red Sox



James' Won-Loss Formula

$$\text{Won} - \text{Loss Percentage} = \frac{\# \text{Wins}}{\# \text{Games}} = \frac{RS_{\text{obs}}^\gamma}{RS_{\text{obs}}^\gamma + RA_{\text{obs}}^\gamma}$$

Where do we want success and significance?

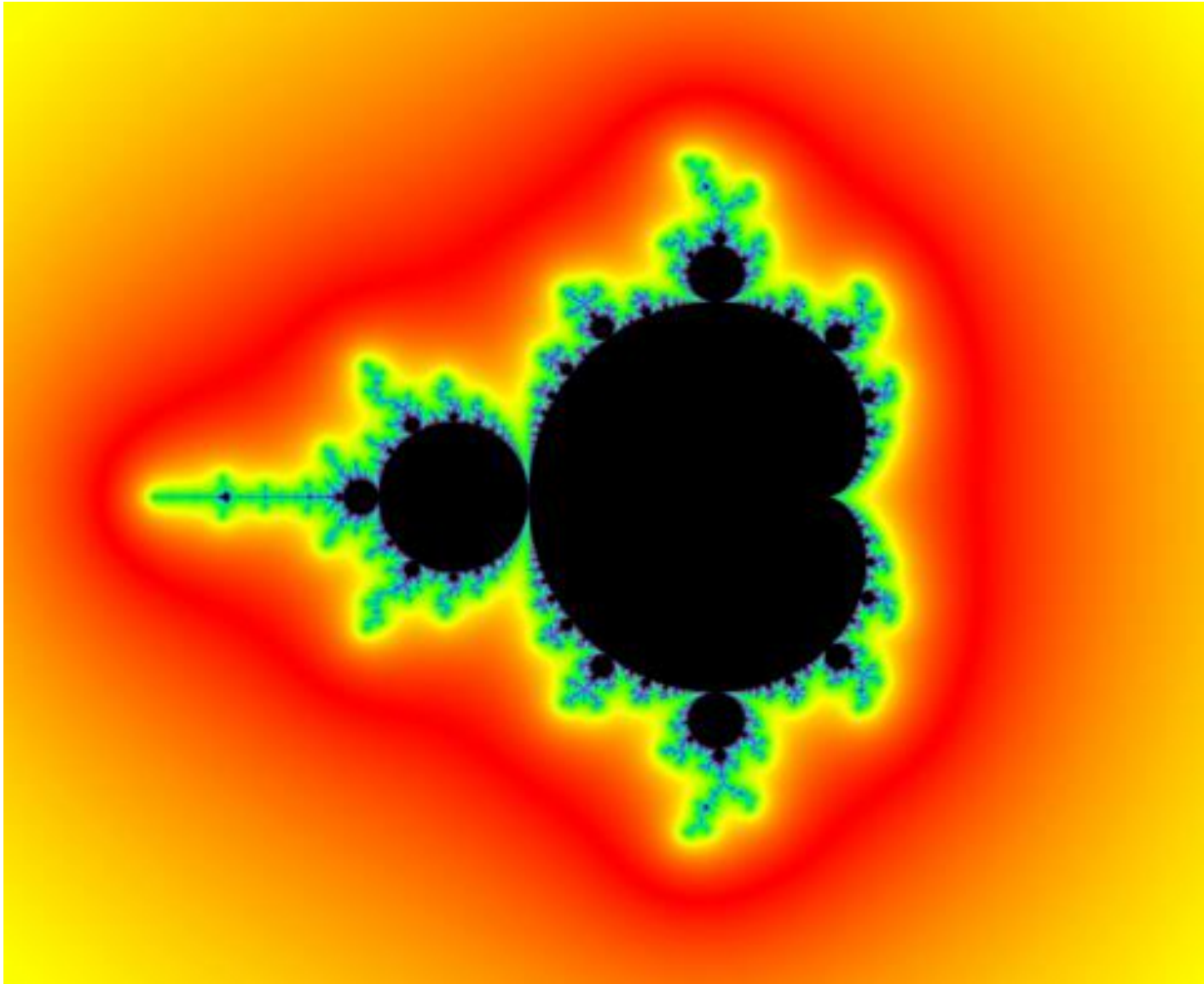
- **Finite time: prioritize.**
 - Academic / professional
- **Community**
 - Personal / family
 - Spiritual



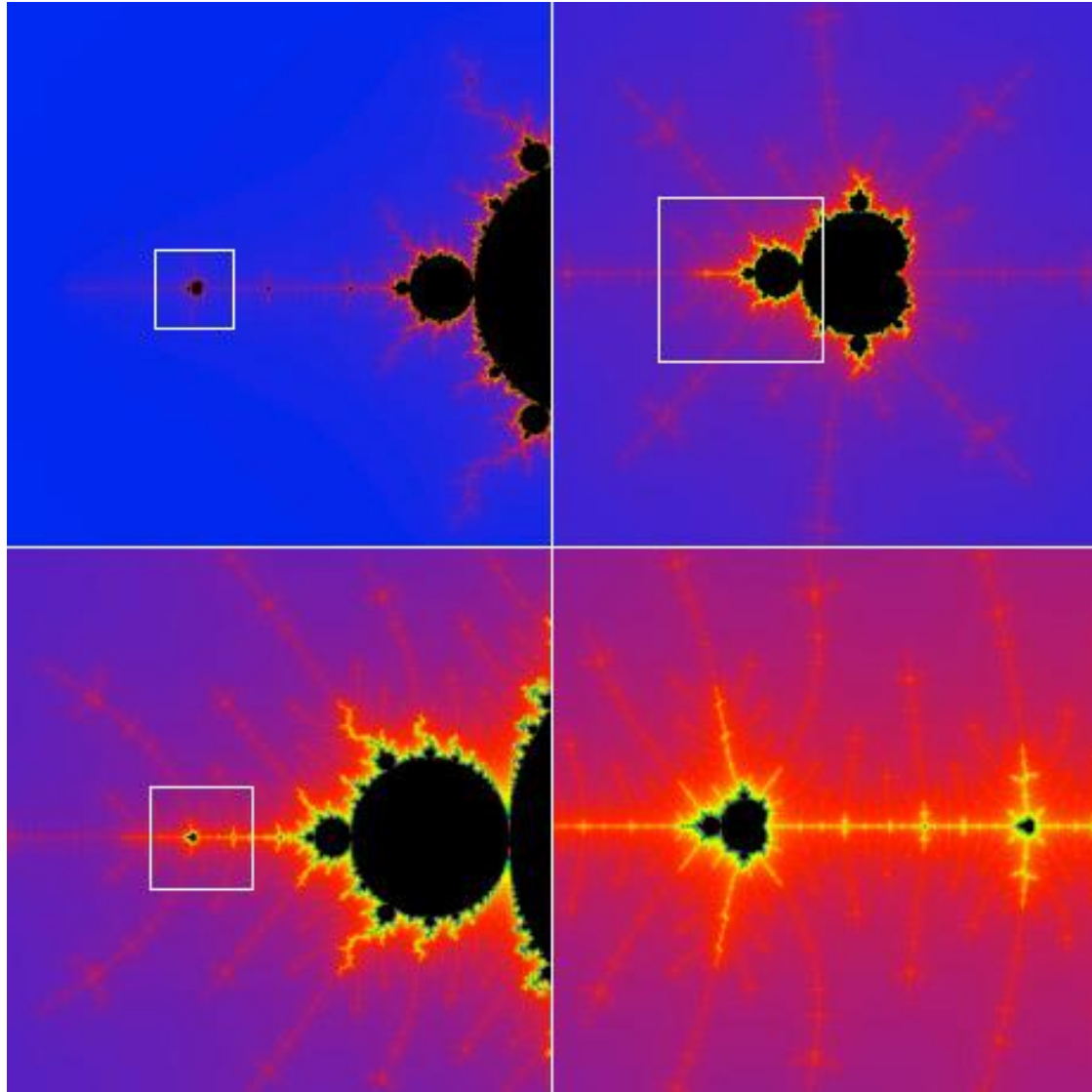
Mandelbrot set: $f(z) = z^2 + c$



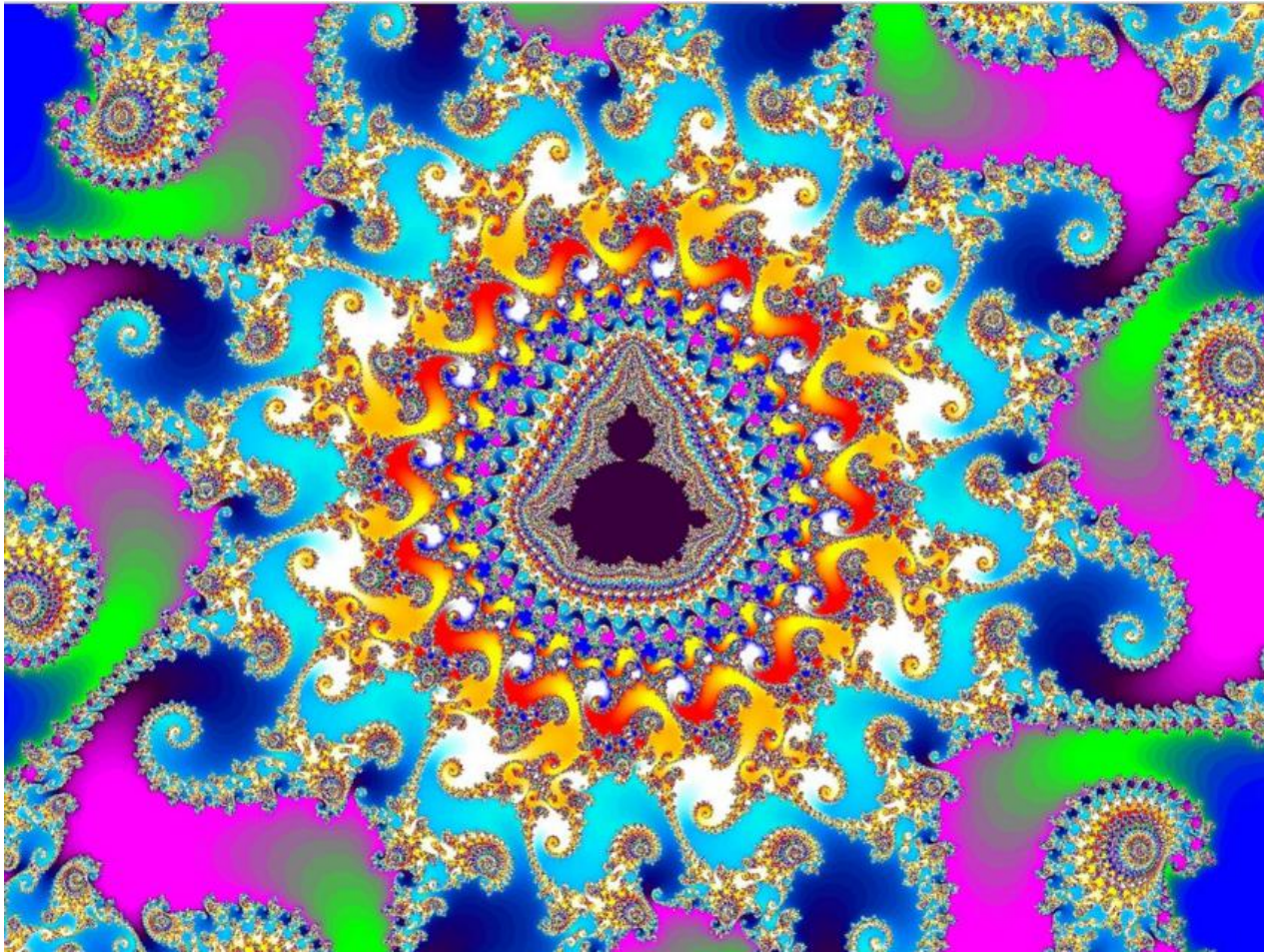
Mandelbrot set: $f(z) = z^2 + c$



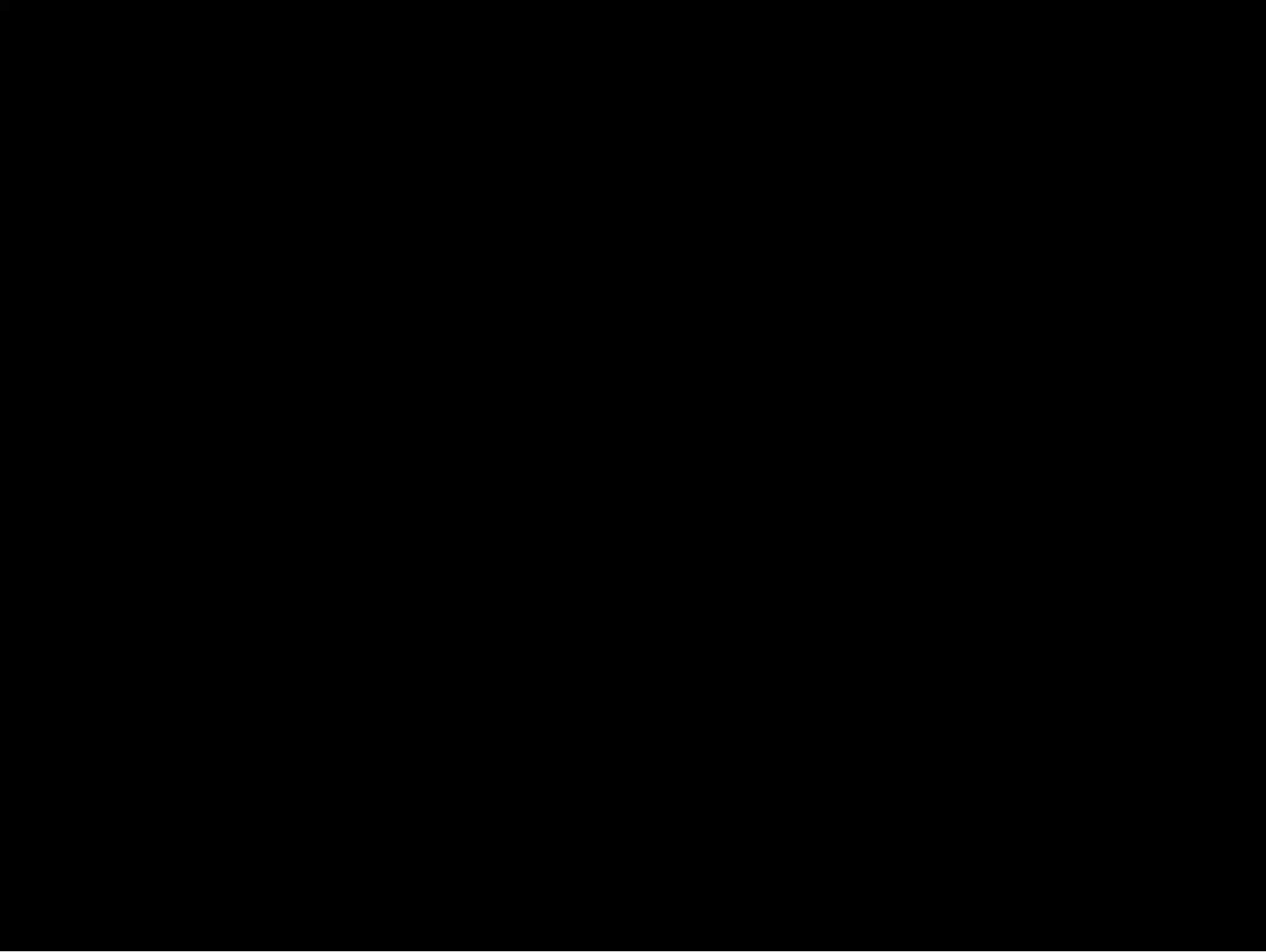
Mandelbrot set: $f(z) = z^2 + c$



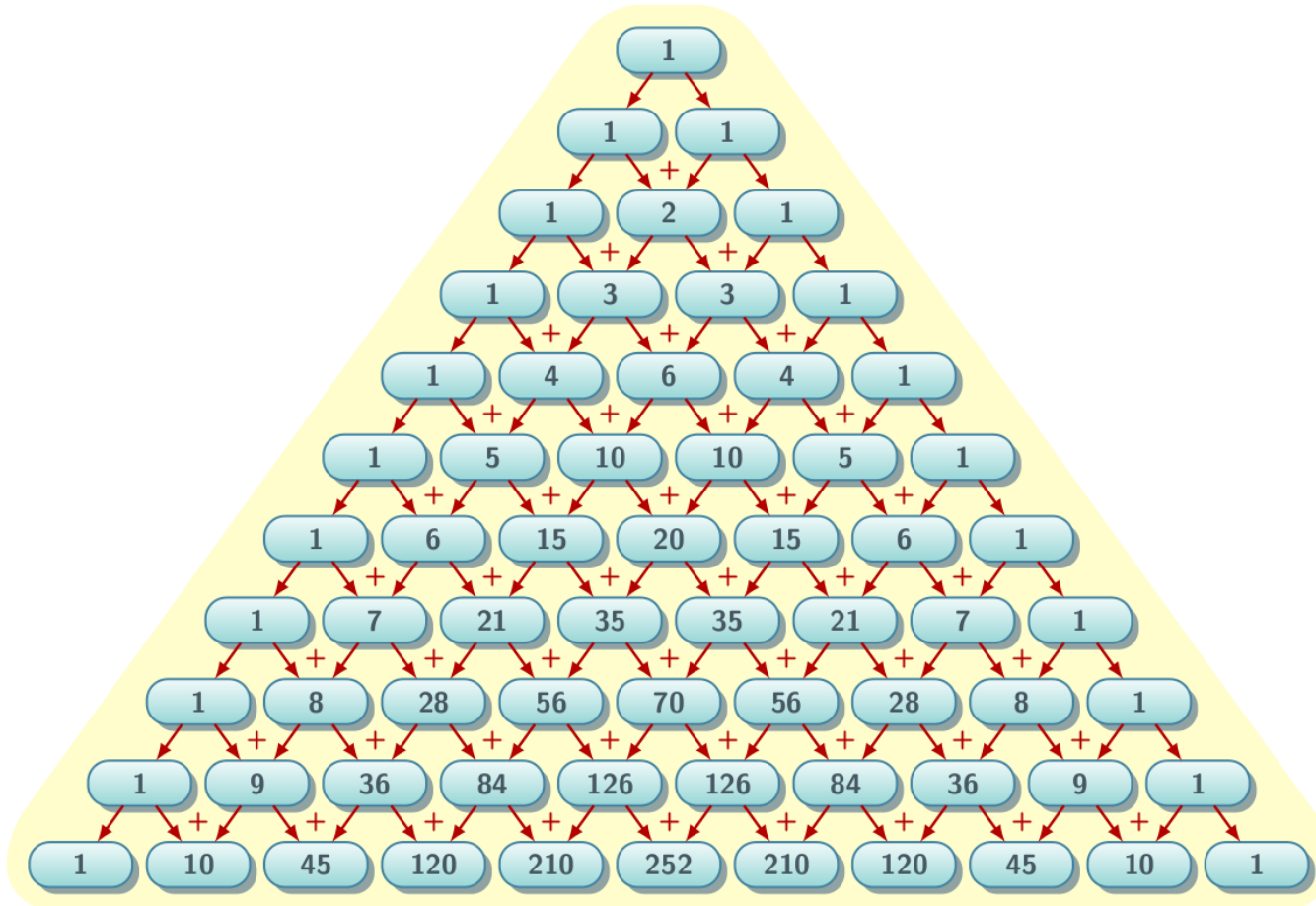
Mandelbrot set: $f(z) = z^2 + c$



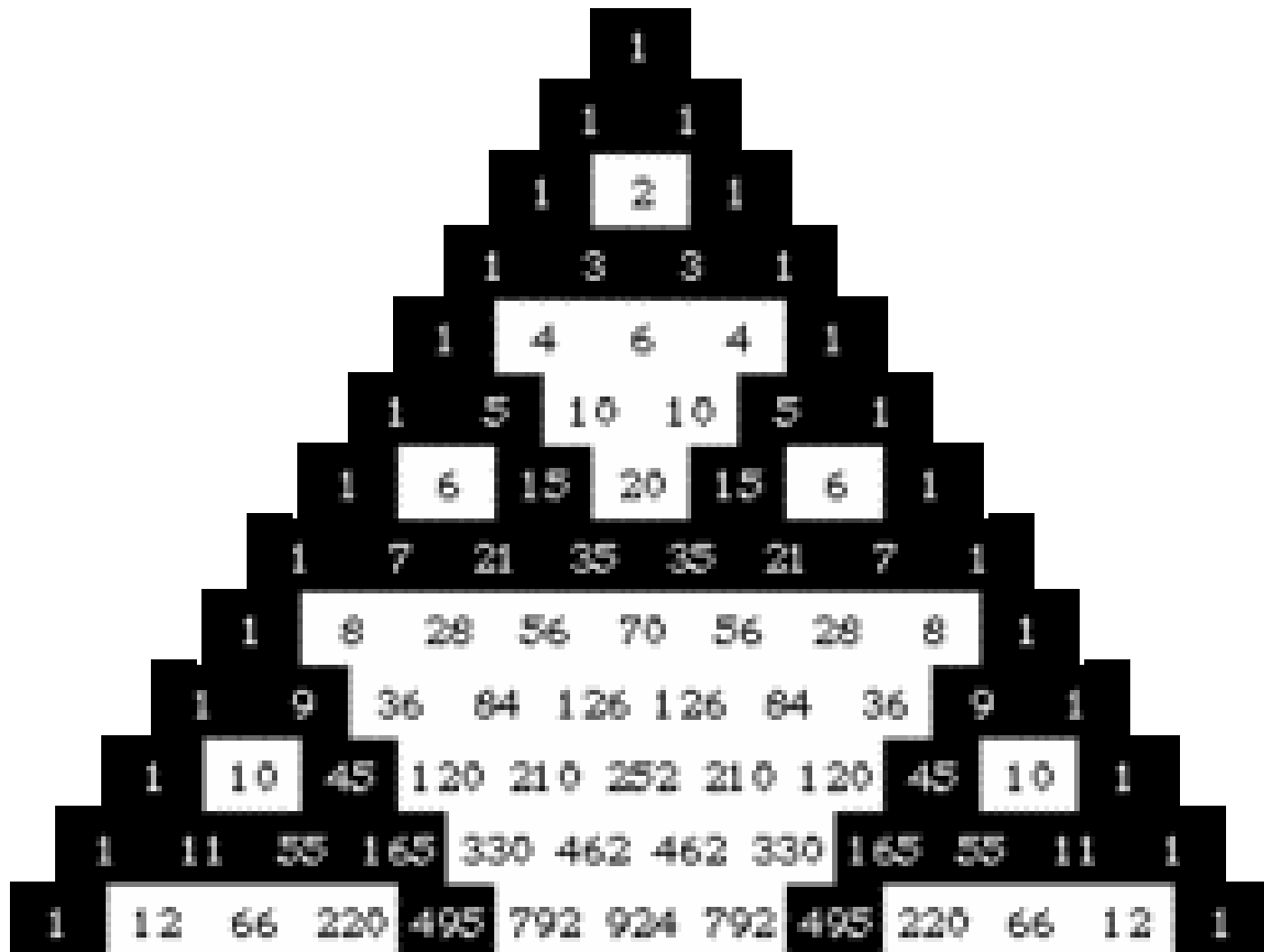
<https://www.youtube.com/watch?v=0jGaio87u3A>



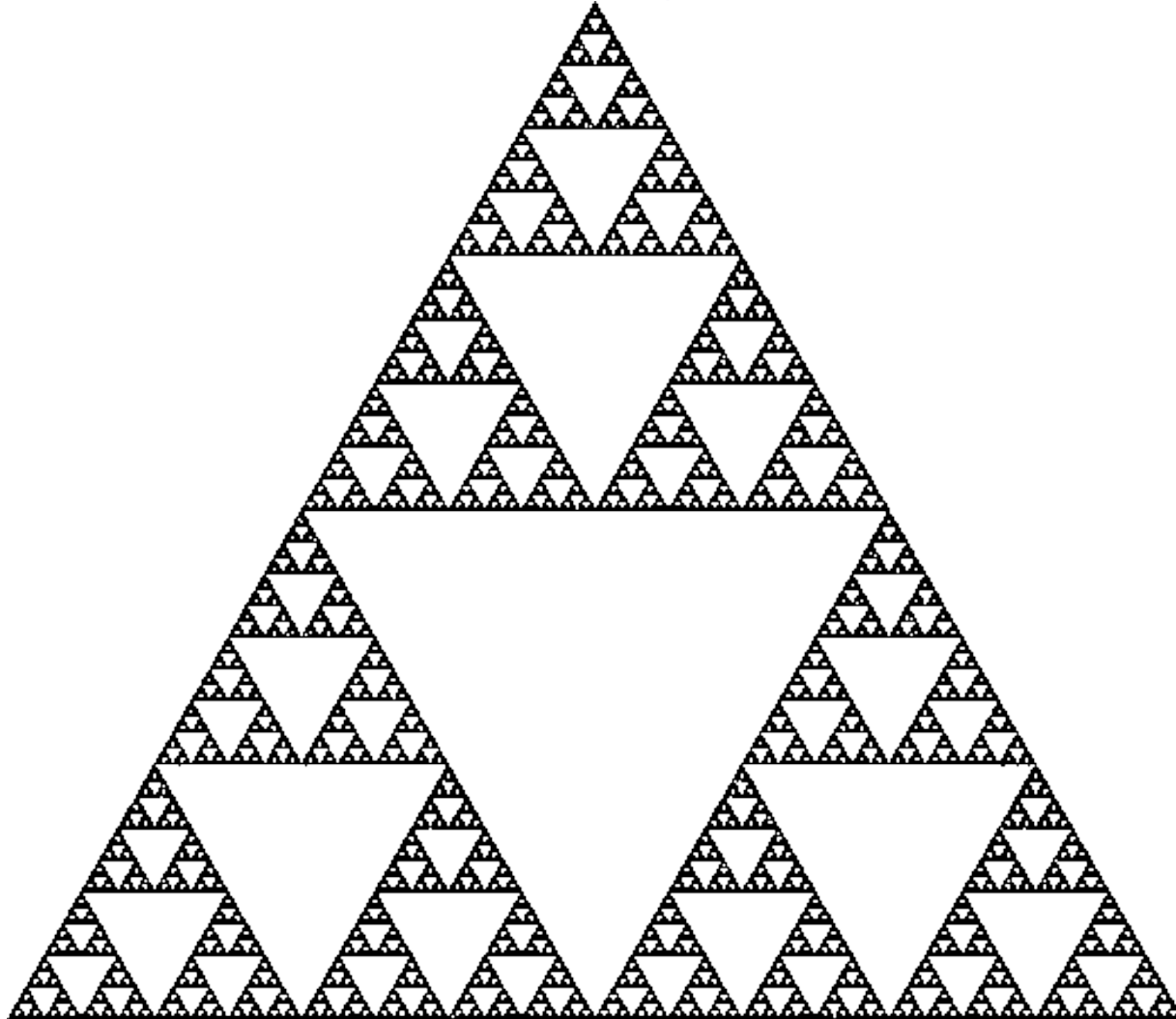
Pascal's Triangle



Pascal's Triangle



Pascal's Triangle mod 2

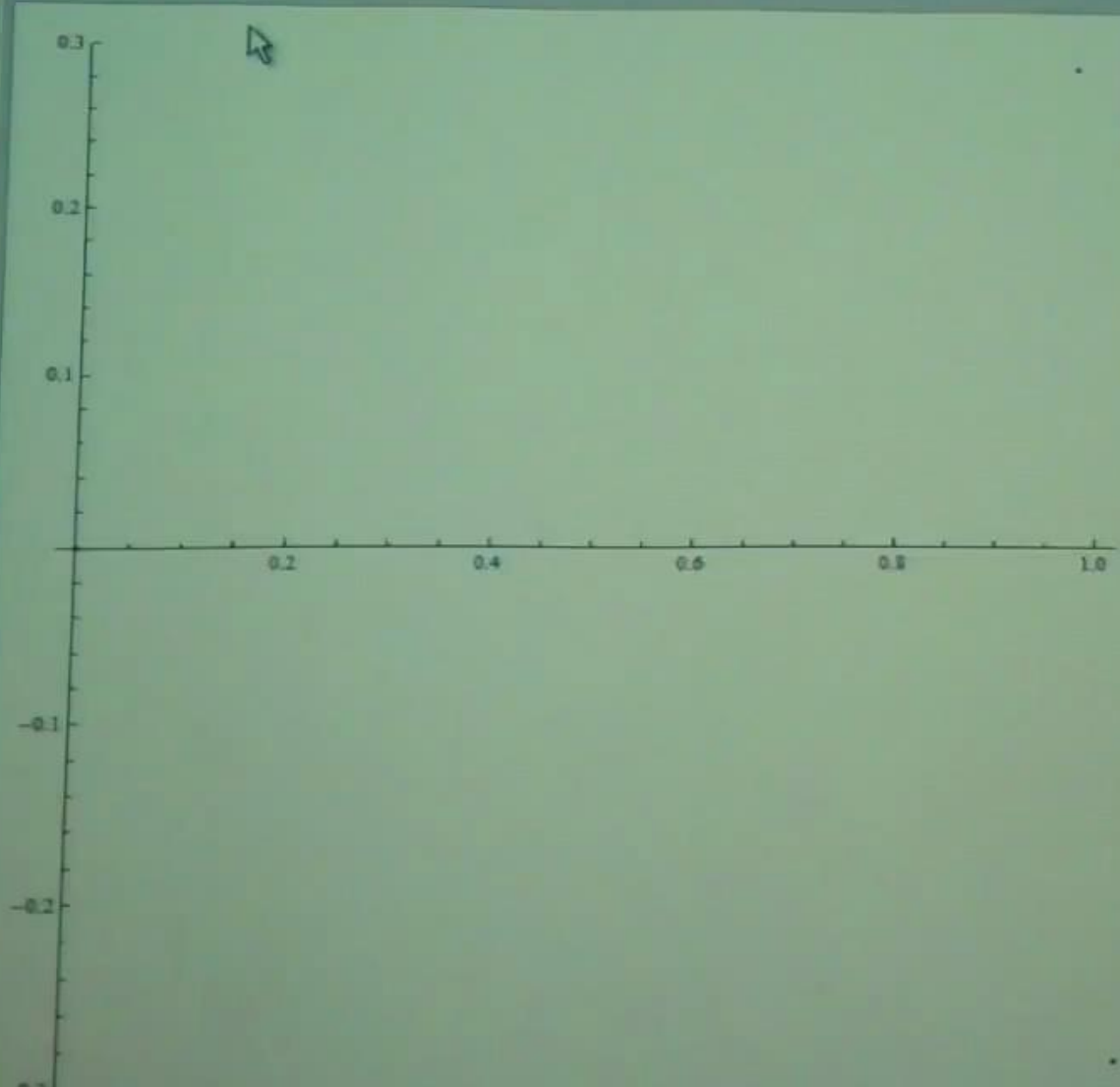


https://www.youtube.com/watch?v=tt4_4YajqRM

m

1. - > + < < > >

Out[121]:



Sierpinski's Hamantaschen



Lychrel Numbers

- Take a number, if a palindrome (34643) stop.
- If not a palindrome, reverse digits, add, continue....
 - $86 \rightarrow 86 + 68 = 154 \rightarrow 154 + 451 = 605 \rightarrow 605 + 506 = 1111$
- Do we always end in a palindrome?
 - If yes how many steps?
 - If not how many fail?

Lychrel Numbers

- Believe most numbers fail, but no known example!
- First few candidates:
 - **196**, 295, 394, 493, 592, 689, 691, 788, 790, **879**, 887, 978, 986, 1495, 1497, 1585, 1587, 1675, 1677, 1765, 1767, 1855, 1857, 1945, 1947, **1997**.
 - Have iterated 196 to a number with 600+ million digits and no palindrome yet....
 - If bored try 89 and 1,186,060,307,891,929,990.

Lychrel Numbers

Write simple code to investigate.

```
reverse[n_] := FromDigits[Reverse[IntegerDigits[n]]];  
f[n_] := n + reverse[n];  
lychrel[n_, max_] := Module[{  
  i = 0;  
  value = n;  
  While[i <= max,  
    {  
      value = f[value];  
      If[value == reverse[value], { i = max + 1; Print[value, " ", "Palindrome"]},  
        Print[value]];  
    i = i + 1;  
  }];  
];
```

10,000th iterate of 196 ($\approx$ 4100 digits)

- 6643864828137164591874471073371693613872164937905775182688462223158120367008161308993655994382483661015471770696460498
6751984305765380581805608640575628722761982329313986217591595245883251732980880734270739621660879553254184820911966944
6476090941365776758610460750974081855857176434090115598099559701673854517631685919767144910531242539775632149623443468
5671303519902896450900977165489109594723592379805416211391961672764049841114942179102589339021111545736837069198875771
5815650508273199306274486492457150950449573236114048013164386528704471774492686272065581549431211971077433502742464138
1151070558729177745603432219609193979454523411791846720996220291692726647826988694177533073677287257521684422867021937
9538455438756785240088749300852680884340844894551221597290673262661501084896998005498966830389506423651054055841471850
3258935963278247940435745718143571886897868320411478317896907057266484737229877996407896120436042430453834406973783769
6969706213135070290791011997980724090824102593779032936065072250940056614179422319053215868751781042772313884617655962
2382583953632558783127135664232171305039078513834890397924438821380672852232096173805394984066684848549988797641394334
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42601853691854727307295584356 if you can read this you don't need glasses

Golden State and the Emirp Quest



Source: CNN

Sheldon Cooper on 73: <https://www.youtube.com/watch?v=TIYMmbHik08>

References

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- Hardy's quotes:
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 - <https://en.wikipedia.org/wiki/File:Mandel.png>
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 - The Limiting Spectral Measure for Ensembles of Symmetric Block Circulant Matrices (with Gene S. Kopp Murat Koloğlu, Frederick Strauch, Wentao Xiong). [Journal of Theoretical Probability](#) (26(2013), no. 4, 1020--1060)
 - **The quadratic character experiment.** Jeffrey [Stopple](#). *Experimental Mathematics* vol. 18, no. 2 (2009) pp. 193-200