

TODO:

- Understand the Pythagorean Triplet algorithm - derivation from primitive Pythagorean Triple “formula”
- Optimization of Collatz Conjecture Sequence (maybe -> using existing nodes)
- Extensions to fun questions:
 - Collatz Conjecture -> create a graph relating odd numbers to their next odd node -> from (1, 1000)
 - * Frequency graph
 - Program (visualization) factors being generated from a number using the prime factorization algorithm: find prime numbers upto $n/2$ (p_1, p_2, \dots, p_n) -> divide $n/p(n)$ if $(n\%p == 0)$
- Project Ideas:
 - Curve Image (Re)generation: input image -> identify curves -> create (predicted) $f(x)$ for each curve -> recreate image using $f(x)$ instead of original curve [parameters: $f(x)$ limited to quadratic, cubic, (linear), etc]

General:

- Better understand every “optimization” found within the Euler page
- Go through current iPython Notebooks to find optimizations for each algorithm (-> significant optimizations)
 - Factors: currently iterating/creating prime factorization for each triangle number ($p_1^{e_1} * p_2^{e_2} * p_3^{e_3} \dots * p_n^{e_n}$) and finding amount of factors using $((e_1+1) * (e_2+1) * (e_3+1) \dots (e_n+1))$
 - Maximum Path Sum: find a more effective method of generating orders -> 2^n (currently iterating through numbers upto 2^{n+1} and going through (if) statements... (inefficient)) -> find more effective way of getting solution -> comparing values?

Notes:

<https://www.math.utah.edu/~alfeld/math.html>:

Mathematics requires no memorization, it requires connective understanding. Everything within the field of math is interconnected, and built up of smaller simpler concepts.

Understanding Mathematics means to:

- Be able to explain mathematical concepts and facts in terms of simpler concepts and facts
- Making logical connections between different facts and concepts
- Recognize the connection when you encounter something new (both within and outside of mathematics), that’s similar and connected to the mathematics

- Identify the principles within a given piece of mathematics that make it work

Acquiring Mathematical Understanding:

- Strive for understanding, rather than memorization
 - Do exercises
 - Always check answers for plausibility
 - Don't use technology to create your answers:
 - Use it to check your answers
 - Take care of routine tasks efficiently
 - Do things that cannot be done by hand
- “The purpose of computing is insight, not numbers”

Sources:

- “What is Mathematics” - Courant and Robbins
- Unsolved Conjectures: “<http://www.math.utah.edu/~pa/math/conjectures.html>”
- How to Solve it - G. Polya ISBN 0-691-08097-6