Computational explorations in modern number theory: the Green–Tao theorem and the abc conjecture

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We present a hands-on example of computational thinking at the intersection of mathematics and programming. Using the **Julia programming language and its Pluto.jl notebook** environment, we visualize exploratory computations inspired by two central themes in modern number theory: the Green-Tao theorem and the abc conjecture. By combining built-in primality tests with compact code written in **Julia**, **Python**, **MATLAB**, and **Mathematica**, we generate long arithmetic sequences of primes and enumerate abc-triplets with unusually small radical values. Our educational objective is to allow students to experience the scale and subtlety of modern number-theoretic phenomena through interactive and reproducible computation.

GitHub

https://github.com/fiomfd/ATCM2025

You can see the following

- Pluto file for this presentation and its html version
- Python, MATLAB and Mathematica for this presentation
- Pluto, Python, MATLAB files for
  - **Calculus I**: differentiability and tangent lines, taylor expansion, Riemann sum
  - **Calculus II**: tangent planes, 2D and 3D polar coordinates, Newton's method vs gradient descent, Riemann sum
  - **Data Analysis**: public data (HK Observatory) and visualization, central limit theorem
  - **Linear Algebra**: grayscale and RGB images, grayscale and RGB movies, SVD and low rank approximation, Haar wavelet decomposition

GitHub / HC

Python & Jupyter Notebook at Google Colab

https://colab.research.google.com/github/fiomfd/ATCM2025/

You can run all the above Jupyter Notebooks of Python on the web.
Your Google ID is required.
No installation is required.

Python at Colab