

Project 0

Getting started

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1 Introduction

The goal of this exercise set is to familiarise yourself with your chosen programming environment and other tools you need.

- If you are familiar with Python or SageMath¹, that is probably a good choice.
- The Jupyter notebook interface to SageMath (and Python) is a useful tool for experiments and learning things. You may use it as your main programming environment if you insist, but it may not be the optimal choice.
- If you want to use C++, using a library like NTL² is probably a good idea.
- If you want to use some other programming environment, check with us first. Keep in mind that we need to understand your code, and that you need (at a minimum) to compute with large integers.

2 Tasks

You will not hand in anything from this project. However, you will use \LaTeX to write a brief report outlining what you did, and in particular showing the code you used to compute and the plot you created.

1. Setup If needed, install your chosen programming environment and get it to work.

2. Get started You should choose your two favourite 200-digit integers, as well as a 100-digit integer.

- Multiply your two 200-digit integers and print the result.
- Multiply your two 200-digit integers modulo the 100-digit integer.
- Check if your programming environment provides polynomial arithmetic. If yes, multiply $X^3 + X + 1$ and $X^7 - 1$.
- Write a small program to compute the factorial function, that is, $x!$. Compute $5!$ and $10!$. Compute the remainder of $95!$ when divided by 101.
- Plot the functions $f(x) = x \ln x - x$ and $g(x) = \ln(x!)$ for $0 \leq x \leq 10$. ($x!$ is strictly speaking only defined for integers, so plot something sensible.)

¹<https://www.sagemath.org/>

²<https://libntl.org/>