

**Homework 6. Number Theory**

In all the questions, you have to give the answer.

**Question 1.** Let  $n$  be a natural number. What is the largest possible value of  $\text{GCD}(2n + 3, n + 7)$ ?

**Question 2.** Find the residue of the number  $7^{120}$  modulo 143.

**Question 3.** Find some natural number  $n$  such that the decimal notation of the number  $3^n$  ends in ...0001

**Question 4.** Find the smallest natural  $n$  such that the number  $2023!$  is not divisible by  $52^n$ .

**Question 5.** Find the two smallest consecutive natural numbers whose sums of digits are divisible by 11. Write the smallest of the two numbers as your answer.