



NUMBER THEORY I
SPRING 2018

ASSIGNMENT 12.1
DUE APRIL 18

Exercise 1. Use the Fermat Factorization Method to factor the following integers. Each is the product of exactly two primes.

- a. 162326009
- b. 22720493292449
- c. 11343830246405657969

Exercise 2. When an integer can be written as a sum of two relatively prime squares in two distinct ways, it is composite and can be factored as follows.

- a. Show that if $n = a^2 + b^2 = c^2 + d^2$, then

$$n = \frac{(ac + bd)(ac - bd)}{(a + d)(a - d)}.$$

- b. Use part a to factor

$$493 = 18^2 + 13^2 = 22^2 + 3^2$$

and

$$38025 = 168^2 + 99^2 = 156^2 + 117^2.$$