Math 328K (Daniel Allcock)
Homework 11, due Friday Apr. 14, 2017

Problem 1. Compute the following exponentials
(a) $848^{187} \mod 1189$.
(b) $2^{340} \mod 341$. (Caution: the way 340 and 341 appear makes this look like a straight application of Fermat’s Little Theorem. The answer, once you compute it, might also suggest this. But it’s not an application of FLT. Why not?)

Problem 2. Use Fermat’s Little Theorem to show that 1681 is not prime. (There are other ways to show this, but you must use Fermat’s little theorem.)

Problem 3. Compute the following exponentials. (Hint: it’s waaaaaay to much trouble to use the general powering method.)
(a) $3^{999,999,999} \mod 7$
(b) $2^{1,000,000} \mod 17$.

Problem 4. Show that $a^{12} - 1$ is divisible by 35 whenever $\gcd(a, 35) = 1$. (Do not work out the 35 cases. Hint: we recently covered a method for breaking big problems into smaller ones.)

Problem 5. If $p$ and $q$ are distinct primes then $p^{p-1} + q^{p-1} \equiv 1 \mod pq$. 