Math 105: Homework 5

Due November 07, 2025

Most questions are from the textbook but have been copied here for your convenience.

1. Find $\phi(n)$ for $n = 20, 60, 63, 341$, and 561.
2. Show that if $(a, 561) = 1$, then $a^{80} \equiv 1 \pmod{561}$.
3. Show that if n is odd, then $\phi(2n) = \phi(n)$.
4. Find the last three digits of 7^{9999}.
5. Factor $x^2 - 3x - 3$ into linear factors (poly mod 5.
6. Factor $x^2 + 1$ into linear factors (poly mod 17.

As a reminder, please write clearly and fully explain your solutions. It is OK (and even encouraged) to work with your classmates to solve the problems, but if you do so, you should write your solutions up separately. Copying solutions from your peers or a solutions manual will be deemed academic misconduct. You are not allowed to search the internet and/or use LLMs to aid you in completing this homework.