Some notes on the homework assignment:

- Remember to acknowledge your collaborators and cite your sources. The template has a section built in for you to do this (see the comments in the template).
- Remember to let me know if you can't do your peer review this week (for any reason)!

Here's the schedule of when things are due for this assignment.

Component Due	**Date**
Draft of Solutions	Thursday, May 19
Peer Review	Tuesday, May 24
Final Copy	Friday, May 27

And finally, here are the problem statements.

1. *Suppose that m has a primitive root. Show that the product of all elements of $(\mathbb{Z}\,/\,m\mathbb{Z})^{\times}$ is congruent to -1 mod m.*
   Hint: This reduces to Wilson's Theorem when m is prime.

2. *Suppose that m has a primitive root, r. Show that $a \equiv b \mod m$ if and only if $\operatorname{ind}_r(a) \equiv \operatorname{ind}_r(b) \mod \varphi(m)$.*
   Note: This shows that "taking indices is invertible."

3. *For which positive integers a is the congruence $ax^4 \equiv 2 \mod 13$ solvable?*

4. *Let $N = 2^j u$ be a positive integer where $j \geqslant 0$ and u is odd. Let p be an odd prime and factor $p - 1 = 2^s t$ where s and t are positive integers with t odd. Show that if $0 \leqslant j < s$, then there are $2^j(t, u)$ incongruent solutions of $x^N \equiv -1 \mod p$. Show that there are no solutions otherwise.*