# Homework 7



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, February 24 |
| Peer Review | Tuesday, March 1 |
| Final Copy | Friday, March 4 |

And finally, here are the problem statements.

1. *Find a complete set of residues modulo 7 so that...*
   (a) *...each residue is even*
   (b) *...each residue is odd*
   (c) *...each residue is prime*
2. *Prove that if $m > 4$ is composite, then*
$$(m-1)! \equiv 0 \mod m$$
3. *Let $p$ be an odd prime. Show that $x^2 \equiv 1 \mod p$ has exactly two incongruent solutions mod $p$.*
4. *Show that $x^2 \equiv 1 \mod 2^s$ has four distinct solutions $\mod 2^s$ when $s \geqslant 3$.*

   *Hint: Do examples! Try $s = 3, 4,$ and $5$ and find the solutions. What pattern do you notice?*