Due Date: Thursday, November 30 at 5PM EDT

Carefully read and provide solutions to the problems below, showing all work required to justify any conclusions you make. You are encouraged to collaborate with your classmates, but all solutions turned in should be your own work. If you do collaborate, please record the names of those other students on your submitted work. Finally, your work should be submitted as a PDF on Gradescope before the listed due date.

Textbook problems: 27.2, 29.4(b - c)

Hint for 29.4: see HW 5, Problem 2.

Problem 1. Find all incongruent solutions to $x^5 \equiv 14 \pmod{101}$.

Problem 2. (Lecture 13.2, Exercise 1) For each prime p and number a, find a formula for the p-adic expansion of a, or find at least the first 6 digits of the p-adic expansion.

(a) $p = 3, a = 72$

(b) $p = 7, a = 320$

(c) $p = 7, a = 321$

(d) $p = 7, a = \frac{320}{49}$

(e) $p = 7, a = -1$

(f) $p = 11, a = -1$

(g) $p = 11, a = \frac{1}{2}$

(h) $p = 3, a = \frac{24}{17}$

Problem 3. (Lecture 13.2, Exercise 2) Do you see a pattern for the p-adic expansion of -1? Try to prove your pattern.