THE UNIVERSITY OF BRITISH COLUMBIA

Math 312 Section 951

Calculators are allowed
No cell phones or information sheets
Test begins at 10:00 am and ends at 10:50am

TEST #3 July 26, 2023

NAME

STUDENT NUMBER

Find all solutions of each of the following linear congruences

1.(a) $3x = 6 \bmod 9$

1.(b) $17x = 14 \bmod 21$

2. (a) Find a complete system of residues mod 5 consisting entirely of primes

2. (b) Find a complete system of residues mod 10 which contains at least 8 Fibonacci numbers.

3. Use the method shown in the proof of the Chinese Remainder Theorem to construct a simultaneous solution to the following system of linear congruences, where here, as usual $x = y \bmod z$ means z divides x-y. Show the steps in your argument.

$$x = 7 \bmod 11$$
$$x = 8 \bmod 13$$
$$x = 9 \bmod 17$$

4. Construct a simultaneous solution to the following system of linear congruences. Show the steps in your argument.

$$x = 5 \bmod 6$$
$$x = 3 \bmod 10$$
$$x = 8 \bmod 15$$

5. (a) Find the largest integer n that cannot be expressed in the form $5x + 11y$ for nonnegative integers x and y. Show work.

(b)For the n that you found in part (a) find all the solutions in the integers to $5x + 11y = n$.