THE UNIVERSITY OF BRITISH COLUMBIA

Math 312 Section 101

Calculators are allowed
No cell phones or information sheets
Midterm begins at 11:00 am and ends at 11:50 am

MIDTERM

NAME

STUDENT NUMBER

November 9, 2018
MARKS

1. Find all solutions to
[10](a) $57x = 87 \pmod{105}$
[10](b) $49x = 5000 \pmod{999}$
MARKS

[20] 2. Find all integers x which satisfy all of the following congruences simultaneously

\[ x = 1 \pmod{4} \]
\[ 2x = 3 \pmod{5} \]
\[ 4x = 5 \pmod{7} \]

(Hint: First solve each congruence for x and then use the Chinese remainder theorem)
3. [10] (a) Determine whether 209 passes Miller’s test to the base 2.
   [10] (b) Determine whether 2821 is a Carmichael number.
4. Let $\phi(x)$ be Euler's $\phi$ function.

[10](a) Find $\phi(945)$ and $\phi(144)$

[10](b) Find all integers such that $\phi(x) = 10$
5. Suppose that one digit, indicated with a question mark, in each of following ISBN-10 codes has been smudged and cannot be read. What should the missing digit be. Show your work.

[10] (a) 91-554-212?-6
[10] (b) 0-19-8?3804-9