Family Name:								Student ID:	_ _ _ _	_ _ _ _		
Given Name:												
Tutorial:	Wed	Thur	Fri									
	10am	10:30am	11am	11:30am	12:30am	1pm	2pm	2:30pm	3pm	3:30pm	4pm	4:30pm 5pm
Tutor:	Cahit	Jerry	Jie	Murray	Roumani	Sherwin	Tim	Tom				

37181 DISCRETE MATHEMATICS
LEARNING PROGRESS CHECK 8

INSTRUCTIONS. 40-60 minutes.
Upload **as a single PDF file** on Canvas/Assignments/LPC8 before 7:59pm Tuesday 2 May 2022. (Recommended: 7:40pm)
Late uploads after 7:59pm will not be accepted by Canvas.
Name your file as `LPC8-LastName-StudentID.pdf`. Show all relevant working and steps.
You may refer to your personal class notes, and a basic (non-programmable) calculator.
Work on this on your own, do not discuss with anyone or using Discord/WeChat/Whatsapp/any websites including paid homework sites.

1. (1 mark) (a) Compute $\gcd(119, 16)$.

(b) Find $p, q \in \mathbb{Z}$ so that $1 = 119p + 16q$. [1] Show steps.

answer: $p =$ $q =$

Date: Tuesday 3 May 2022.
[1] Hint: extended Euclidean algorithm.

2. (1 mark) Let $x, y, \lambda, \mu \in \mathbb{Z}$. Prove that if $1 = \lambda x + \mu y$ then x, y are relatively prime.

3. (1 mark) (a) Find a *prime factorization* [2] for $n = 3333$.

(b) Compute $\varphi(3333)$ where φ is Euler's phi function. Show your reasoning.

[2] i.e. write as $p_1^{i_1} p_2^{i_2} \dots p_n^{i_n}$

4. (1 mark) Let $\mathscr{R}$ be the relation

$$x \mathscr{R} y \text{ if } 3 \mid (x-y)$$

on $\mathbb{Z}$.

Prove that $\mathscr{R}$ is an equivalence relation.

5. (1 mark) Let the universe of discourse be $\mathbb{N}$. Let $P(n)$ be the statement "n^2+5n+1 is even".

(a) Which of the following statements is true?

A. $P(n)$ is true for all $n \geqslant 3$

B. $\exists k$ such that $P(n)$ is true for all $n \geqslant k$

C. $\forall k$, if $P(k)$ is true then $P(k+1)$ is true

D. $\forall k$, if $n > k$ then $P(n)$ is true

E. $P(1)$ is true

F. none of (A)–(E).

(b) Justify your choice for part (a).

END OF LPC8