

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 10

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INSTRUCTIONS. 40-60 minutes.

Upload **as a single PDF file** on Canvas/Assignments/LPC10 before 7:59pm Tuesday 17 May 2022. Name your file as `LPC10-LastName-StudentID.pdf`. Show all relevant working and steps. You may use the symbolab website: <https://www.symbolab.com/> to speed up matrix power computations. 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. (2 marks)
 - (a) Draw a picture of a connected undirected graph having degree sequence 2, 2, 3, 3, 4, or explain why no such graph exists.

 (b) Does the graph you drew in part (a) have (Give reasons for each Yes/No answer)
 - (i) an Euler circuit?

 - (i) an Euler path?

 - (ii) a Hamiltonian circuit?
 - (c) Draw two non-isomorphic spanning trees for the graph you drew in part (a).

2. (1.5 marks) (a) Draw a graph which has the following adjacency matrix:

$$\begin{bmatrix} 2 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}$$

(b) Label the vertices of your graph A, B, C, D (in any order).

(c) How many different paths of length 10 are there from the vertex you labelled A to the vertex you labeled D in the graph you draw in part (a)? Show your working. ¹

¹this was covered at the end of Lecture 18.

3. (1.5 marks) Recall the following statement from Worksheet 11:

Theorem 1. *If $G = (V, E)$ is a simple graph (no loops or multi-edges) with $|V| = n \geq 3$ vertices, and each pair of vertices $a, b \in V$ with a, b distinct and non-adjacent satisfies*

$$\deg(a) + \deg(b) \geq n,$$

then G has a Hamilton cycle.

(a) Using this fact, or otherwise, prove or disprove: Every connected undirected graph having degree sequence 2, 2, 4, 4, 6 has a Hamilton cycle.

(b) The statement:

Every connected undirected graph having degree sequence 2, 2, 4, 4, 6 has a Hamilton cycle

is **A.** True **B.** False.