

Special Graphs and Intermediate Definitions

Ian Ludden

Learning Objectives

By the end of this lesson, you will be able to:

Learning Objectives

By the end of this lesson, you will be able to:

- Define and identify K_n , C_n , W_n , and $K_{n,m}$.

Learning Objectives

By the end of this lesson, you will be able to:

- Define and identify K_n , C_n , W_n , and $K_{n,m}$.
- Recall definitions related to “moving around” on graphs.

Special Types (Classes) of Graphs

What if we have...

- n vertices and every possible edge?

Special Types (Classes) of Graphs

What if we have...

- n vertices and every possible edge?
- a cycle on n vertices?

Special Types (Classes) of Graphs

What if we have...

- n vertices and every possible edge?
- a cycle on n vertices?
- a cycle on n vertices, but there's also a hub vertex?

Special Types (Classes) of Graphs

What if we have...

- n vertices and every possible edge?
- a cycle on n vertices?
- a cycle on n vertices, but there's also a hub vertex?
- two separate sets of vertices and every possible edge between?

Walks, Paths, and Cycles

- Walks can repeat vertices/edges and are open or closed

Walks, Paths, and Cycles

- Walks can repeat vertices/edges and are open or closed
- Paths can't repeat vertices/edges

Walks, Paths, and Cycles

- Walks can repeat vertices/edges and are open or closed
- Paths can't repeat vertices/edges
- Cycles: C_n shows up as a **subgraph**

Walks, Paths, and Cycles

- Walks can repeat vertices/edges and are open or closed
- Paths can't repeat vertices/edges
- Cycles: C_n shows up as a **subgraph**
- G is **acyclic** if no cycles as subgraphs

Walks, Paths, and Cycles

- Walks can repeat vertices/edges and are open or closed
- Paths can't repeat vertices/edges
- Cycles: C_n shows up as a **subgraph**
- G is **acyclic** if no cycles as subgraphs
- **Euler circuit**: closed walk that travels every edge exactly once

Stay connected

- G is **connected** if you can get anywhere from anywhere

Stay connected

- G is **connected** if you can get anywhere from anywhere
- “islands” called **connected components**

Stay connected

- G is **connected** if you can get anywhere from anywhere
- “islands” called **connected components**
- **cut edge**, if removed, would disconnect G

How far is it?

- The ***length*** of a walk/path is the number of edges

How far is it?

- The **length** of a walk/path is the number of edges
- The **distance** from u to v is the length of the shortest path

How far is it?

- The **length** of a walk/path is the number of edges
- The **distance** from u to v is the length of the shortest path
- The **diameter** is the max distance over all pairs of vertices

Recap: Learning Objectives

By the end of this lesson, you will be able to:

- Define and identify K_n , C_n , W_n , and $K_{n,m}$.
- Recall definitions related to “moving around” on graphs.