

CS30 (Discrete Math in CS), Summer 2021

Drill 21+22

Topic: Graphs

Instructions

- Please submit all homework electronically in PDF, ideally typeset using LaTeX. If your handwriting is not legible, you may get 0 points.
 - The drills below are supposed to be quick to do and quick to check. If a grader cannot read and understand your solution to a given drill exercise in **1 minute**, you may get a 0.
 - **Collaboration Policy:** You should be able to and indeed should do the drills on your own. Collaboration is not allowed. You can ask clarification questions on Ed Discussion **privately**; the instruction team may choose to make it public. You can refer to the recommended textbook, your own course notes, posted videos, and the posted lecture notes. **Not** the web. When in doubt, consult the instructor.
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Exercise 1. (2 points)

Let $G = (V, E)$ be a graph, and u, v, w be some three vertices of G . True or False:

*If there is a **path** from u to v in G , and a **path** from v to w in G , then there is a path from u to w in G **which contains** v .*

If you answer true, give a very short reason. If you answer false, draw a counterexample.

Exercise 2. (5 points)

- Draw **all** possible trees on 3 vertices $\{a, b, c\}$. (1 point)
- Draw **all** possible trees on 4 vertices $\{a, b, c, d\}$. (2 points)
- Prove that the number of trees on n vertices must be $\geq \frac{n!}{2}$. (2 points)

Hint: look at the trees you have drawn in the two parts above.

Not for points, but for your wondering: how many trees do you think are there on n vertices? You can write your thoughts down if you want to.