

Activity #1 Coloring

DM Graphs
Day 9

On the following pages are some copies of a coloring page for the map of the continental United States.

Question One: Can you color this ~~graph~~ ^{picture} so

- that
- ① Any two states that share a border are different colors, and
 - ② you only use 3 colors?

Question Two: Translate the question above into a graph theory question: figure out how to make a graph using some things as vertices and some connections between those things as edges.

Question Three: Draw the graph in question. What features of your graph help you answer Question One?



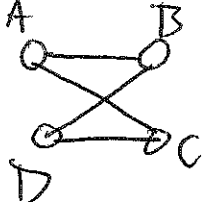
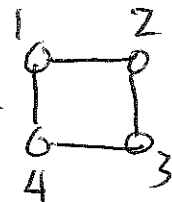


Activity #2 : Isomorphism

DM Graphs
Day 09

Recall that there is a notion of "sameness" for graphs called "isomorphism."

Two graphs are called isomorphic when there is a way to make the vertices of the first graph correspond in a one-to-one manner so that if two vertices in one graph are connected by an edge, the corresponding vertices in the other graph are also connected by an edge.

for Example $G_1 =$  and $G_2 =$ 

are isomorphic b/c we can make the vertices correspond like this

$A \mapsto 1$

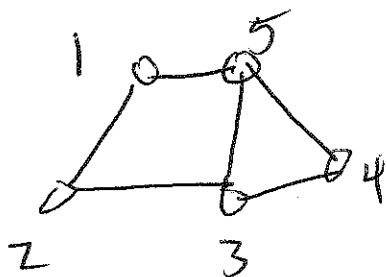
$C \mapsto 4$

$B \mapsto 2$

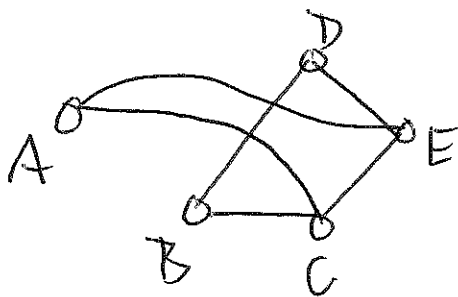
$D \mapsto 3$

Check it!

Question One: Can you show these graphs are isomorphic?

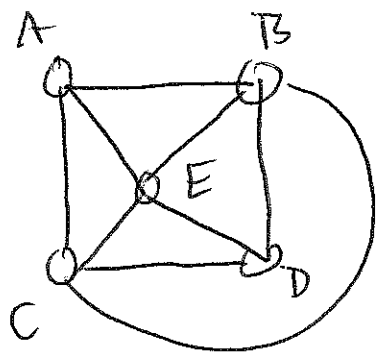


Graph A

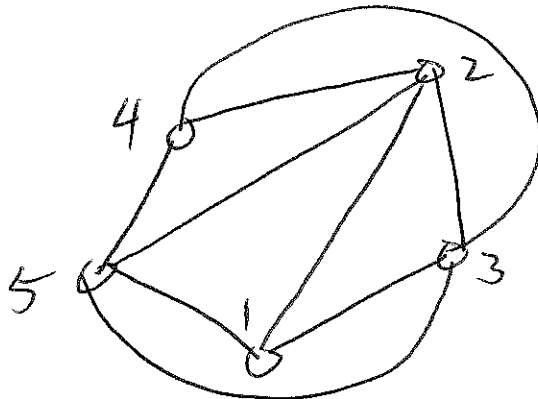


Graph B

Question Two: Are these graphs isomorphic?



Graph C



Graph D

Question Three: If you had to program a computer (which is really dumb, and also can't see a picture) to check if two graphs were isomorphic, what should you tell it to do?