

DUE: FEB 1.

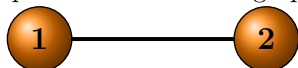
Propose two questions for the upcoming midterm which will be Feb 5, 2016.

The topics should come from class and HW that we have had so far.

Along with each question, *explain why you think this is a good question.*

DUE FEB 3 .

Take a simple graph Γ . There is a canonical procedure which turns it a simple graph Γ into a directed graph $\tilde{\Gamma}$. Take each (undirected!) edge of Γ ,



and double it, making one edge going one way, and the other edge going the other way:



I will refer to the resulting directed graph $\tilde{\Gamma}$ as the “double of Γ ”. (Set-theoretically, whenever $\{v, w\}$ (- an unordered pair of vertices) is an edge of the original simple graph, then $(v, w), (w, v)$ (-ordered pairs of vertices) are the edges of its double.)

EXERCISE 1.

A) Draw the graph known as K_5 , the complete graph on 5 vertices. Then draw its double \tilde{K}_5 . How many edges in the double?

B) Following the notation and procedure of the FEATURED ARTICLE write down the matrix H for the directed graph \tilde{K}_5 .

C) Write down the matrix S for the directed graph \tilde{K}_5 .

D) Write down the matrix G , with α as a variable.

EXERCISE 2.

If Γ is a k -regular simple graph and $\tilde{\Gamma}$ its directed double, show that the matrix S for $\tilde{\Gamma}$ (as per the FEATURED ARTICLE) is a multiple of the adjacency matrix for Γ . Find the multiple. Assume $k > 1$.