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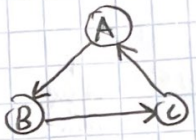
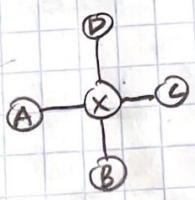
# Homework 0

1. Give an example of a graph in which every node is pivotal for at least two different pairs of nodes. Explain your answer.




In the above graph, every node is pivotal for 3 different pairs: (A,C), (B,A), (C,B). This is because the graph is directed with nodes A, B, and C all having in-degrees and out-degrees of one. If the graph was undirected, the above mentioned pairs would have lengths of one rather than two, discarding one of the nodes.

2. Give an example of a graph having at least four nodes in which there is a single node X that is pivotal for every pair of nodes (not counting pairs that include X). Explain your answer




In the above graph, node X is pivotal for 6 different pairs: (A,B), (A,C), (A,D), (B,C), (B,D), (C,D). Node X is pivotal because it edges with nodes A, B, C, D act as bridges. If these edges were removed, the nodes would be their own components. If additional edges were added in the case of triadic closure, X would no longer be pivotal.