

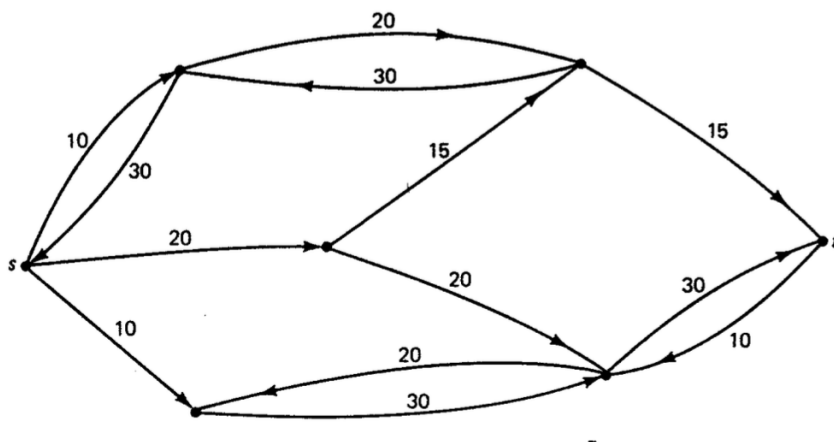
Last name _____

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LARSON—MATH 356—CLASSROOM WORKSHEET 27
P and NP

Review

- What is a cut in a network?
- What is the capacity of a cut?
- What is the Max Flow - Min Cut Theorem?
- What is a *min-max theorem*?



1. Find any cut (W, \bar{W}) in this network. Find $\text{cap}(W, \bar{W})$. What does this tell you about *any* flow in this network?
2. Find a non-zero flow in this network? What does this tell you about the capacity of any cut in the network?
3. What is a Hamilton cycle in a graph?
4. If a graph G has a Hamilton cycle, how can you prove it?
5. If a graph does *not* have a Hamilton cycle how can you *prove* that it does not?
6. What is a Euler circuit in a graph?

7. If a graph G has a Euler circuit, how can you prove it?
8. If a graph does *not* have a Euler circuit how can you *prove* that it does not?
9. If a graph has an independent set with at least k vertices, how can you prove that it does?
10. If a graph does *not* have an independent set with at least k vertices, how can you prove that it does not?
11. What is a *decision problem*? What are examples?
12. What is an NP-property (or when is a decision problem *in* NP)?
13. Is the Hamilton graph decision problem in NP?
14. Is the Euler circuit decision problem in NP?
15. Is the independent set decision problem in NP?
16. What defines the decision problems that are in the class P ?
17. What problems that we've talked about are in P ?
18. What defines the decision problems that are in $co-NP$?
19. What are examples of $co-NP$ decision problems?