Last name _____

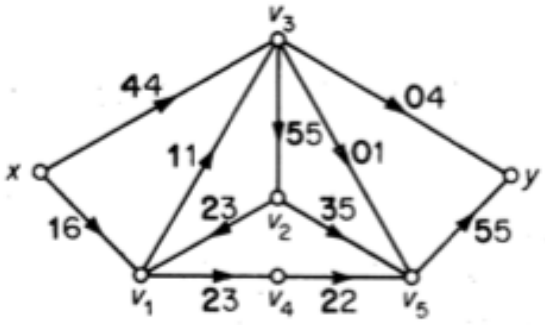
First name _____

LARSON—MATH 556—CLASSROOM WORKSHEET 26
Max Flow-Min Cut Theorem

Review

- What is a *network*?
- What is a *flow* in a network?
- What is the *value* of a flow in a network?
- What is the *capacity* of a cut $\nabla^+(A)$ (or a separator A) in a network?
- What is an *f-augmenting path to u_k* in a network? What is an *f-augmenting path* in a network?

Network Flows



1. Does this network have a flow-augmenting path?

2. (**Claim:**) A flow f is maximum if and only if there are no f-augmenting paths.

3. (**Max-Flow Min-Cut Theorem:**) The value of a maximum flow in a network equals the capacity of a minimum cut.

4. (**Flow Integrality Theorem**:). If the capacities of a network are integers, then there exists a maximum flow which is integral on every line.

A Max Flow-Min Cut Proof of Kőnig's Minimax Theorem

5. Let G be the milkbone graph. It bipartite, so $G = (A, B)$. Build a network G' by directing all lines of G from A to B, adding a new point s (the "source") joined to all points of A and a new point t (the "sink") to which all points of B are joined, and then assigning capacity ∞ to all lines of G and capacity 1 to all new lines of G'.

6. Find a maximum flow. What do you notice?

7. Can you see how to generalize this example to give a new proof of Kőnig's Theorem?