

**CSE 551**  
**Problem Set #3**

Due: 4:30pm, Thursday, December 10, 2009

1. Debunk the following paper: Faloutsos, Faloutsos, and Faloutsos. On power-law relationships of the Internet topology. SIGCOMM 1999. Hint: consider sample bias.
2. Can transient loops occur with BGP, if no BGP route advertisement messages are ever lost? Explain why or why not.
3. Alicia, a student in 550, decides to implement “prime-Paxos” for her class project, a version of Paxos that modifies the proposer to favor consensus on prime values whenever consistent with both safety and liveness. (Of course, P1 still holds: composite values can be proposed and accepted.) The leader will normally order prime values ahead of composite ones, but Alicia asserts there is flexibility even when there are multiple proposers. Specifically, she asserts that the constraint at the bottom of page 4 of the Paxos Made Simple paper is too strict: it is sometimes safe (satisfies P2b) to propose a (prime) value (one found in some prepare reply), even though the value of the highest numbered proposal responding to the prepare message is composite. Is Alicia correct, and explain why or why not by means of an example. Hint: under what circumstances is it possible to send the accept request, without waiting for all the prepare replies to arrive? Is there a difference between ignoring late prepare replies and ignoring those that are composite?

Extra credit: Alicia’s partner Fred takes this one step further, and asserts it is possible to propose a prime value, even though all of the values returned in replies to the prepare request are composite. Are there any circumstances when this would be safe? Explain why or why not.