Homework Exercise #5
Due: November 5, 2008

5. Consider a synchronous message-passing system where all processes know the network graph G. Up to f of the processes may experience halting failures. Moreover, Dr Evil has been lurking around and might take over one of the processes and make it behave in his characteristically evil way. Give necessary and sufficient conditions on G to make it possible to solve consensus satisfying

- **termination**: every correct process produces an output.
- **agreement**: every output (except the one produced by Dr Evil's process) gives the same output, and
- **validity**: if every process (except the one controlled by Dr Evil) has input v, then every correct process outputs v.

You may assume inputs are binary. Prove your answer is correct.