MS&E 235: Internet Commerce

Practice Problems for the Final.

1. Consider a bandit, which in every period is either successful or unsuccessful. Suppose a player has discount factor θ, and initial prior (α, β) for the bandit. Let $V(\alpha, \beta, \theta, I)$ be the value function assuming that in every period the player can either play the bandit and continue playing or get paid I and stop. Assume that $V(\alpha, \beta, \theta, 0.2) = 0.4$, $V(\alpha, \beta, \theta, 0.6) = 0.65$, $V(\alpha, \beta, \theta, 0.7) = 0.7$, and $V(\alpha, \beta, \theta, 0.8) = 0.8$.

   - Which of the values out of 0.2, 0.4, 0.6, 0.65, 0.7, and 0.8 could be the Gittins' index? [5 pts]
   - Which is the narrowest range for the Gittins' index that you can conclude? [5 pts]

2. Give an example where two nodes can collaborate to increase their PageRank by a large factor. Characterize this factor as a function of ϵ, where ϵ is the reset probability. [10 pts]

3. Is eBay's bidding mechanism closer to a second price auction or a first price auction? Explain very briefly.

4. Suppose there are m web pages of type 1 and n web pages of type 2. Let the type 1 web pages be $A_1, A_2, ..., A_m$ and let the type 2 web pages be $B_1, B_2, ..., B_n$. Each web page of type 1 has a link to a web page of type 2. Also, each web page of type 2 has a link to a web page of type 1. What is the naive PageRank of each page in terms of m and n?

5. Which of the following Bernoulli random networks are connected with high probability as N goes to infinity?

   - The probability p is 0.1
   - The average degree is 10
   - The average degree varies as $\sqrt{N}$.

6. Which of the following are likely to benefit from network neutrality? Which are not? Explain very briefly.

   - Comcast
   - Netflix
   - Sprint
   - Skype
   - AT&T
   - Twitter