Math 485/585 Exam 2 (take home part) Due to May 15.

1. (20 pts) Customers arrive at a three-pump gas station at an exponential rate 20 cars per hour. However, customers will only enter the station for gas if some gas pumps are free. Suppose that the amount time required to service is exponential with a mean of five minutes for each pump.
(a) What proportion of customers enter the station?
(b) What is the average time number of customers in the station?
(c) What is average amount time that an entering customer spends in the station?

2. (20 pts) Customer arrive at a two server system at Poisson rate two per hour. An arrival finding the system empty is equally likely to enter service with either server. An arrival finding one customer in the system will enter service with the idle server. An arrival finding two others in the system will wait in line for the first free server. An arrival finding three in the system will not enter. All service times are exponential with rate one per hour, and once a customer is served (by either one), he will departs the system.
(a) Find the long-run probabilities of the number of customer in the system.
(b) Suppose that a customer arrives and finds two others in the system. What is the expected times he spends in the system?
(c) What is the average time an entering customer spends in the system.

3. (20 pts) (If you take this course as 585, please do it. If you take this course as 485, I will account 10 pts as bonus credits when you have a correct answer). In problem 2, we assume that two services have different rates: two per hour and one per hour, respectively. Find the long-run probabilities of the number of customers in the system.