

MATH/STAT 416 Second Midterm Exam  
April 11, 2012.

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- Make sure to put all your answers in the space provided.
- Be sure to give complete justification for your answers and to show your work. Your goal is to give a convincing argument to me of the answer that you provide.
- No calculators or other electronic enhancements are permitted.
- You are not to receive nor GIVE aid to other students on the exam.
- Write your name below if you understand these instructions.

Name: \_\_\_\_\_



(c) What is the variance of the number of women selected by the time of the selection of the tenth man?

(d) If 10 men are selected within 4 days, what is the probability that exactly 10 women are selected in the same four days?

(e) Suppose that only one man with skin cancer arrives in the first day. Assuming the study started at midnight, was he more likely to arrive before noon or after noon? Explain your answer.

(f) If we continue to suppose only one man arrived in the first day, what is the expected number of patients with skin cancer to arrive in that first day?

2. (40 pts) Two people are working in a small office selling shares in a mutual fund. Each is either on the phone or not. Suppose salesman one is on the phone for an exponentially distributed amount of time with rate  $\mu_1 = 2$ . Salesman two is on the phone for an exponentially distributed amount of time with rate  $\mu_2 = 3$ . The rate for an individual salesman to stay off the phone is  $\lambda = 3$ .
- (a) Write down the  $Q$  matrix for a continuous time Markov chain representing WHICH salesman is on the phone. (The state space could be described with  $\{0, 1, 2, 12\}$ , for example.)
- (b) Can one easily formulate a Markov chain,  $X(t)$ , which represents only the number of salesmen on the phone? If so, write down the new  $Q$  matrix for this modified chain. If not, then why not?

(c) Find the stationary distribution for the chain in part (a).

(d) Find the  $v_i$  and  $P_{ij}^*$  for the continuous time Markov chain in (a).