MATH.3860
Prob and Stats – Test 2 Spring 19   Name: _phong Vo_

1. (10 points) A bleary eyed student awakens one morning late for an 8:00 class, and pulls out two socks out of a drawer that contains two black, six brown and two blue socks, all randomly arranged. Compute the probability that the two he draws are a matched pair.

2. (10 points) A manufacturer of electrical equipment markets a lightbulb that has an average life expectancy Y of 3000 hours, and pdf

$$f_Y(y) = \frac{1}{3000} e^{-y/3000} \quad y > 0$$

He offers a moneyback guarantee on bulbs that fail to last 300 hours. For what proportion of his sales will he need to make a refund?

3. (10 points) Five cards are dealt from a standard poker deck. Let X be the number of aces received, and Y the number of kings. Compute the conditional probability $P(X = 2|Y = 2)$

4. (15 points) A random variable X has the pdf

$$f_X(x) = 2x \quad 0 < x < 1$$

What is the variance of $Y = 3X + 2$

5. (15 points) (a) Urn I contains 5 red chips and 4 white chips. Two chips are drawn from Urn I without replacement. Consider the number of white chips in the sample of two drawn. Compute the probability distribution of the number of white chips in the sample: I want the probabilities of the three events W_0, W_1 and W_2 of drawing zero, one or two white chips.

   (b) Urn II has 4 red and 5 white chips. The sample of two drawn from urn I are put into urn II. Then a single chip is drawn from urn II. What is the probability that the chip drawn from urn II is white? (Hint: condition on the three events W_0, W_1 and W_2.)

6. (20 points) A continuous random variable Y has pdf $f_Y(y) = 3y^2$ for $0 \le y \le 1$

   (a) What is the probability that Y takes a value in the interval $(1/2, 1)$?

   (b) Suppose that 15 observations are chosen of the random variable Y. Let X denote the number of these observations that lie in $(1/2, 1)$. What kind of random variable is X?

   (c) Determine $E(X)$

7. (20 points) On planet Alpha, the prison sentence X (in years) of persons convicted of cheating on probability exams has the pdf

$$f_X(x) = \frac{1}{9}x^2 \quad 0 < x < 3$$

   (a) What is the *average* length of time these cheaters spend in jail?

   (b) What is the *median* time in jail (I want the number m so that $P(X < m) = P(X > m)$).