Name:

MATH 321: Homework 2

Due _____: Turn in a hard copy, neat and stapled.

1. Let $X_1, \ldots, X_9$ be a random sample from Exponential ($\lambda = 5$).
   (a) Find the cdf of $X_{(7)}$.
   (b) Find the pdf of $X_{(3)}$.

2. Let $X_{(1)}, \ldots, X_{(10)}$ be the order statistics from a continuous distribution with 70th percentile $x_{0.7} = 24.3$.

   Determine $P(X_{(8)} \leq 24.3)$ and $P(X_{(3)} \leq 24.3)$.

   HINT: Think about the information $x_{0.7} = 24.3$ tells us.

3. A pharmaceutical researcher is testing the effect of a medication measured on a continuous scale. Effects from the medication are independent and have continuous uniform distributions on (3,10). The researcher randomly selects five patients to examine.
   (a) Find the probability that the smallest effect is between 3 and 5.
   (b) Find is the expected value of the smallest effect and of the second largest effect.

   CAN USE TECHNOLOGY to solve the expected values.

4. **Excel q–q plots**: We are going to investigate some real data and try to figure out what potential distribution a dataset came from. Data can be found in the the starter file, which is where your work should be done as well.

   Guidelines:
   (a) Create a histogram of the data. Be sure to add axis labels and a title.
   (b) Complete discussions for (1) and (2) located in the template based on the histogram.
   (c) Create two q–q plots, one for testing for the standard normal distribution and one testing another distribution we have learned. The goal for the latter is to find the best model (or at least a better model) for the data.

   Feel free to try several distributions (NOTE: will need to lookup the appropriate <dist>.inv() functions in Excel).
   (d) Once you are satisfied with a model, complete discussion (3) located in the starter file based on the q–q plots.

   Submission: This problem will be worth 15 of the 30 points. Please submit a completed version of the starter excel file.

Select answers

1. (a)

   (b)

2. $P(X_{(8)} \leq 24.3) \approx 0.3828$ and $P(X_{(3)} \leq 24.3) \approx 0.9984$
3. (a) $P(3 \leq X_{(1)} \leq 5) \approx 0.81406$

   (b) $E(X_{(1)}) = 25/6$ and $E(X_{(4)}) = 23/3$
4.