MAT 2377 A (Winter 2017)
Prof: Rachid Bentoumi

Assignment 5

Deadline : Please submit in the dropbox at 585 King Edward before 7:00pm on Thursday 23 March, 2017.
There are 5 questions.

Please solve the following problems with a calculator authorized by the Faculty of Science (TI30, TI34, Casio fx-260 or Casio fx-300) :

1. Suppose that the lifetime, in months, of a transistor is exponentially distributed with a mean lifetime of 5 months.
   (a) Find the probability that such a transistor lasts longer than 7 months.
   (b) Find the probability that the lifetime of a transistor is between 3 and 8 months.
   (c) Assume that the transistor is now 4 months old and is still functioning. Find the probability that it functions for at least 3 *additional* months.
2. Suppose that the number of phone calls at a call center follows a Poisson process with rate $\lambda = 0.2$ calls per minute. Let X be the waiting time until the first call.
   (a) Find the mean and variance of X.
   (b) What is the probability that the waiting time until the *first* call is less than 1 minute?
   (c) What is the probability that the waiting time until the *third* call does not exceed 2 minutes?
3. Let X be a normal random variable with mean 25 and variance 16. Compute the following probabilities.
   (a) $P(X > 18)$;
   (b) $P(27 < X < 35)$;
   (c) $P(17 \leq X \leq 23)$;
   (d) Find the value of c such that $P(c - X \leq 4) = 0.872$.
4. The volume of apple juice in cans filled by a certain machine is normally distributed with mean 12.05 oz and standard deviation 0.03 oz.
   (a) What proportion of cans contain less than 12 oz of apple juice?
   (b) The mean volume of apple juice can be adjusted by calibrating the machine. If the standard deviation is fixed at 0.03 oz, to what value should the mean be set so that 99% of the cans will contain 12 oz or more of apple juice?
   (c) If instead we modify the standard deviation but fix the mean at 12.05 oz, to what value must we set the standard deviation so that 99% of the cans will contain 12 oz or more of apple juice?
5. For the following random sample

   5.4 4.6 7.2 4.4 3.5 8.9 10.3 2.6 5.8 4.2 4.6 3.5 8.9 10.3 11.5 3.5 5.8

   (a) Find the sample mean and the sample median.
   (b) Determine the first quartile Q_1 and the third quartile Q_3
   (d) Compute the range and interquartile distance (IQR).