MATH 323 - Tutorial 7 Questions

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1. Waiting for the Bus. Suppose Y is a random variable for the time it takes for the 80 bus on Parc to reach Milton Street at the top of the hour. Suppose the random variable Y follows the following Probability Density Function (pdf):

$$\begin{aligned} f_Y(y) &= cy, \quad 0 \leq `y \leq 10, \\ &= 0, \quad \text{Otherwise} \end{aligned}$$

where c is some constant.

a) If the above function is a proper pdf, what must the value of c be?

b) What is the expected time for the bus to arrive?

c) Find the CDF of Y?

d) If you are waiting for the 80 at Milton at the top of the hour, what is the probability that you are waiting between 1 and 3 minutes.

e) Suppose you have already been waiting 5 minutes, what is the probability that the 80 arrives in the next minute?

2. Hydro-Quebec bills are a function of power consumption and the price of Power. Let Z be a random variable representing the power bill. For now, let us assume that you consume a constant amount of energy per month, call this constant ϵ. Suppose the price of electricity (in c/kwh) is a random variable with an exponential distribution and a mean of 5 c/kwh.

a) What is the probability that the bill will be more than \$100.

b) Suppose you know the bill will be more than \$100, what is the probability that it will be more than \$200.

3. Suppose that there are two mutually exclusive causes of machine failure, A and B, which occur with probabilities 0.3 and 0.7 respectively. If the cause of faiure is A, the repair-time random variable, T, has a Normal distribution with parameters μ_A and $\sigma = 45$, whereas if the cause is B, the T has a normal distribution with parameters $\mu_B = 4$ and the same $\sigma = 45$. Writing your

answer in terms of the standard normal CDF, what is the probabiltiy that:

a) a failure from cause A takes longer than 3 hours to prepare?

b) a machine which fails will take longer than 3 hours to repair?

c) There was a Type A failure, given that the repair time is longer than 3 hours?