MTH 201: QUIZ 2

It is given that $\Phi(.5) = .6915$, $\Phi(1.04) = .85$, $\Phi(1) = .8413$, $\Phi(2) = .9772$, $\Phi(.67) = .7486$ and $\Phi(3) = .9987$

Total: 100 points

1) PROFESSOR HIJBIJBIJ works as a system personel responsible for transfer of data packets in an organization called "SYMPOHONY OF COMPUTER SCIENCE". The time interval between receipt of two data packets follows an exponential distribution with mean 0.5 hours. . Professor HIJBIJBIJ comes to the office and discovered that the modem has received the last data packet 10 minutes back.

(a) Derive the conditional CCDF and the corresponding PDF of the waiting time of Professor HIJBIJBIJ for a data packet to arrive.

(b) What is the expected value of the time Professor HIJBIJBIJ has to wait for a data packet to arrive ?

(c) Suppose 12 minutes have passed since Professor HIJBIJBIJ's arrival. What is the expected value of the additional time Professor HIJBIJBIJ has to wait for a data packet to arrive ?

(d) Repeat the same problem if the time between the arrival of two data packets follows uniform (0, 40) distrribution.

[30 points]

2) An engineer commutes daily from his suburban home to his factory. The average time for a one-way trip is 24 minutes, with a stscovered that the modem has received the last data packet 10 minutes back.

(a) Derive the conditional CCDF of the waiting time of Professor HIJBIJBIJ for a data packet to arrive. (b) What is the expected value of the time andard deviation of 3 minutes. Assume that the trip time is normally distributed.

(a) What is the probability that the trip will take atleast half an hour ?

(b) If the factory opens at 9:00 AM and he leaves his house at 8:45 AM daily, what percentage of the time is he late for work ?

(c) If he leaves the house at 8:34 AM and coffee is served at the factory from 8:50 AM until 9:00 AM, what is the probability that he misses coffee ?

(d) Find the length of time above which we find the slowest 15 percent of the trips ?

(e) Find the probability that two of the next three trips will take atleast half an hour ? (You can leave your answer as a product of powers of decimal numbers.)

[30 points]

3) Your car has broken down at noon. You have called a repair team, which left at 12:00 from a place 100 miles from where you are. They travel at 100 miles per hour. In the meantime, you try to fix the car yourself. The chances of success are uniform in the time interval between 12:00 and 1 o'clock with total probability $\frac{1}{2}$. If you succeed, you will drive to meet

the repair team at 100 miles per hour. Let X be the distance traveled by the team before they meet you. (The fee you pay depends on it). Find the CDF of X.

[20 points]

4) Suppose that X and Y are jointly continuous random variables with joint density

$$f_{X,Y}(x,y) = \begin{cases} ce^{x+y} & \text{if } x, y \leq 0 \\ 0 & \text{otherwise} \end{cases}$$

(a) What is the value of c ?

(b) What is the probability that $X < Y$.

(c) What are the marginal densities f_X and f_Y ?

[20 points]