Exercises for Mathematical Economics

1) We discussed this example in the class but now we will be more precise. Assume that the population of Italy is 50 million. The probability of being infected is 0,2% (be careful, not 2%). The accuracy rate of the most successful COVID-19 test is 99%.

a) How many people are actually infected in Italy? How many of Italians are healthy?

b) If all healthy Italians took the test, how many positive results (indicating sickness) would there be?

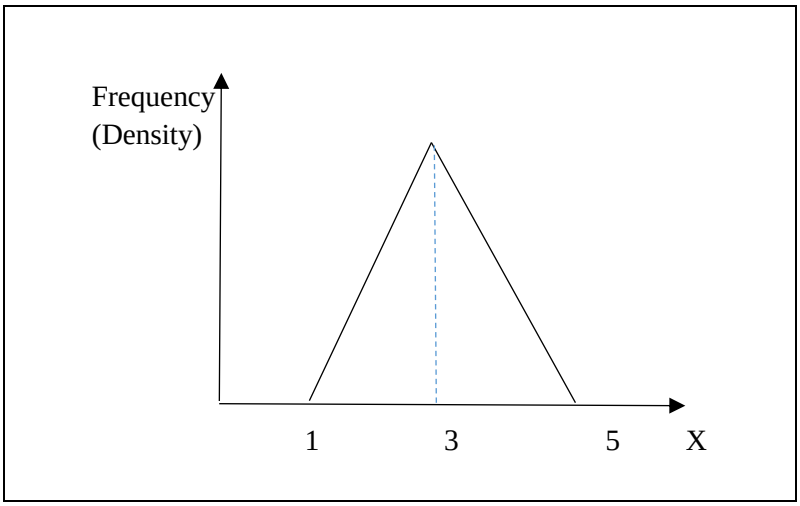
c) If all infected Italians took the test, how many positive results (indicating sickness) would there be?

d) Now suppose Mariana's test result is positive (indicating infection). What is the probility that she is actually infected?

2) Let the cumulative distribution function of X is $P(X \leq x) = 1 - e^{-x}$. What is the expected value of X, denoted by $E[X]$.

3) Solve the same question by assuming $P(X \leq x) = 1 - e^{-2x}$. Do you see a pattern? What do you think the answer would be if $P(X \leq x) = 1 - e^{-ax}$ where $a > 0$ is a given constant.

4) Consider a random variable X whose probability density function (PDF) is given below. What is the probability that $X < 2$?



5) Answer the same question for the probability distribution below.