Prep Course

Module I Homework 5

Due 23:30, Saturday, August 10th, 2024 (Chicago time)

For this Homework, you should submit a single PDF named: **M1HW5_LASTNAME_Firstname.pdf**

Problem 1

Let X denote the number of typographical errors on a single page of the lecture notes. Let's assume that X has Poisson distribution with parameter $\lambda = 1$. Calculate the probability that there is at least one error on a randomly chosen page. Please round off your answer to 4 decimal places.

Problem 2

Do P1.62. You may assume that $X_1, X_2, \dots, X_n$ are independent. You will receive

- 10/10 if you properly derive the CDF of M;
- 15/10 if you properly derive both the CDF and the probability density function of M.

Problem 3

Do P1.67

Problem 4

A certain unpleasant disease affects 150 people, on average, out of every 100,000.

Scientists have developed a test with an amazing accuracy of 99%. In other words, if a person has the disease, the test will be positive with probability 0.99; if they don't, it'll be positive with probability 0.01.

If a person chosen uniformly at random from the population tests positive, what's the probability they have the disease?

Please round off your answer to 4 decimal places.

Problem 5

Let R be the region bounded by the graph of $y = x^2$, $x = 0$, and $y = 4$ in the first quadrant. Please compute the following double integral:

$$\iint_{R} xe^{y^2}\,\mathrm{d}x\mathrm{d}y$$

Please round off your answer to 1 decimal place.

Problem 6

A man is known to speak the truth 4/5 times. He throws a die and reports it is a 5. Find the probability that it is actually a 5. Let's assume that, when he throws the die and decides to not report the true number, the remaining 5 numbers are equally likely to be chosen by him to report.