

Math 201, Spring 2022

Problem Set # 4

Due February 16, 2022 at 11:59pm on gradescope

Question 1. Show that if $X \sim \text{Geom}(p)$ then

$$P(X = n + k | X > n) = P(X = k), \text{ for every } n, k \geq 1.$$

This is sometimes called the *memoryless property* of the geometric distribution. It says that if there are no successes in the first n trials then the probability that the first success at trial $n + k$ is the same as the probability that a freshly started sequence of trials yields the first success at trial k . The first n trials are forgotten.

Question 2. Consider the square in the plane consisting of all (x, y) such that $-1 \leq x \leq 1$ and $-1 \leq y \leq 1$, and let Q be a point chosen uniformly at random inside the square. Let X be the distance from Q to $(0, 0)$.

1. Calculate $P(X > 1)$.
2. Calculate $P(X < 0.5)$.