Exercise 1 (Borel-Cantelli II). Let $A_1, A_2, \ldots$ be independent events. Show that if \[ \sum_{n=1}^{\infty} P(A_n) = \infty, \] then \[ P(A_n \text{ infinitely often}) = 1. \]

Exercise 2 (Poisson process basics). Suppose students arrive at office hours according to a Poisson process at rate $\lambda = 0.6$ students per hour. The professor will hold office hours for two hours, and if at least one student has come by the end, then the professor goes home. Otherwise, worrying about the sunk cost, the professor will stay in their office until a student arrives.

1. Find the probability the professor stays for more than 2 hours.
2. Find the probability the professor stays for between 2 and 5 hours.
3. Find the probability that at least two students come to office hours.
4. Find the expected number of students who come to office hours.
5. Find the expected total time for office hours, given that office hours are held for more than 4 hours.