- 1. N is a Geometric(P) random variable. The success probability P itself is a Uniform random variable independent of N. You observe that N = 2. What is the PDF of P given this event? (**Optional**) In general what is the PDF of P given N?
- 2. Let X be an Exponential( $\lambda$ ) random variable. Find the PDF of the random variables (a)  $Y = X^2$  and (b)  $Z = e^{-\lambda X}$ .
- 3. Raindrops hit your head at a rate of 1 per second. What is the PDF of the time at which the second raindrop hits you? How about the third one? (**Hint:** convolution)
- 4. The body temperatures of a healthy person and an infected person are Normal(36.8, 0.5<sup>2</sup>) and Normal(37.8, 1.0<sup>2</sup>) random variables, respectively. About 1% of the population is infected.
  - (a) What is the conditional probability that I am infected given that my temperature is t?
  - (b) For which values of t am I more likely to be infected than not?