Practice Questions

1. The body temperatures of a healthy person and an infected person are Normal$(36.8, 0.5)$ and Normal$(37.8, 1.0)$ 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?

2. A coin has probability P of being heads, where P itself is a Uniform$(0, 1)$ random variable. The coin is flipped twice. Given that it comes out heads both times, what is the (posterior)

   (a) PDF of P?

   (b) expected value of P?

   (c) probability that the next two flips are both heads?

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. In this question you will calculate the PDF of a *product XY* of two independent Uniform$(0, 1)$ random variables X and Y.

   (a) What is the PDF of $X' = \ln X$?

   (b) What is the PDF of $Z = \ln X + \ln Y$?

   (c) What is the PDF of $e^Z = XY$?