

Economics 520, Fall 2009

Homework 2

Due Tuesday, September 15 at start of class

1. Suppose a breathalyzer has 5% false positives and 8% false negatives. That is, only 5% of the time will it indicate that a person is drunk when he is actually sober and 8% of the time will it indicate that a person is sober when the person is in fact drunk. Using this test, the police spot test a population of drivers, 99% of whom are sober. What is the chance that a person, who tests as drunk, is actually sober?
2. Consider the Monty Hall example discussed in lecture, but now suppose that the host (Monty Hall) does not know which door the prize is behind. Instead, he opens one of the two remaining doors (after you have picked a door) at random. If Monty opens a door, and it does not contain the prize, is it still in your interest to switch to the third door?
3. Let F be the cumulative distribution function of a random variable X , where X is continuous. Find the cumulative distribution function of $Y = \alpha X + \beta$, where $\alpha < 0$ and β are constants.
4. Suppose X is a continuous random variable with pdf $f(x)$ and CDF $F(x)$. For a fixed number x_0 such that $F(x_0) < 1$, define

$$g(x) = \begin{cases} f(x)/(1 - F(x_0)), & x \geq x_0 \\ 0, & x < x_0 \end{cases}$$

- (a) Show that $g(x)$ is a valid pdf.
 - (b) Describe in words the random variable with pdf $g(x)$.
5. CB 1.54
 6. CB 2.1
 7. Let $f(x) = 1/3$ for $-1 < x < 2$ and zero elsewhere be the pdf for a random variable X . Find the pdf and distribution function for the random variable $Y = X^2$.
 8. R Exercise: write R function definitions for the following functions. Print out the function definitions and check them by calculating some specific values. Also, use the curve function in R to plot these functions over the unit interval $[0, 1]$.
 - (a) $f(x) = 1 + 2x - x^2$.
 - (b) $f(x) = \log(1 + x)$.
 - (c) $f(x) = e^{-x}$.