

STA 114: STATISTICS

HW 1

Due Wed Sep 7 2011

This homework is intended to be a review of the materials you are expected to be familiar with. You may consult chapters 1-5 of DeGroot and Schervish for a brush up.

1. Suppose a researcher thinks that a 10% of all human beings are left-handed. What's the probability that in a randomly chosen sample of 10 students she'd have at least one left hander? What's the probability that in a randomly chosen sample of 500 students she's have at least 50 left handers?
2. Let $U \sim \text{Uniform}(0, 1)$. Find the pdf of the random variable $X = \log \frac{U}{1-U}$.
3. Let X have the exponential distribution with mean 1. Find EY where $Y = \min(X, 1)$.
4. Let $N \sim \text{Poisson}(\lambda)$ and Y , given $N = n$, be conditionally distributed as $\text{Binomial}(n, p)$, where $\lambda > 0$ and $p \in (0, 1)$. Show that the marginal distribution of Y is $\text{Poisson}(\lambda p)$.
5. Let X and Y be independent $\text{Exponential}(1)$ random variables. Define $V = X + Y$ and $W = X - Y$.
 - (a) Find the joint density of V and W .
 - (b) Find the marginal densities of V and W .
 - (c) Are V and W independent? Justify your answer.
6. Suppose U_1, U_2, \dots, U_{100} are independent $\text{Uniform}(0, 1)$ random variables. Find the probability that $U_1 + U_2 + \dots + U_{100} > 55$.