Statistics 1211 Spring 2008 HW 5

Due in class or in my mailbox before class on March. 3

Section 1 (out of 20 points):

This section includes an R assignment dealing with the exponential distribution (see page 157 of the book) and the simulation of "randomness". In statistics, it is usually assumed that it is possible to generate "random" variables. We will explore how computers are used to generate random variables with a given distribution.

a) Remember the following claim from HW 4: Let X be a random variable with distribution function $F(x)$ and assume F^{-1} exists. Then $F(X)$ is a random variable which has what distribution? Show that is true mathematically (Hint: it is the uniform distribution; show why by calculating $\mathbf{P}(F(X) \leq x)$.

b) Show that if X has the exponential distribution with parameter λ, then $F^{-1}(x) = \frac{-\log(1-x)}{\lambda}$.

c) Start up R and type in the following command after the carrot sign (your computer screen should look like:)

```
> testdata <-runif(100,0,1)
```

To understand this command, type in

```
> help(runif)
```

Type 'q' to quit the help screen. Explain what "testdata" is.

Type in

```
> plot(testdata)
```

and

```
>hist(testdata)
```

Explain what is being graphed by R.

d) Now, type in

```
>invexp<-function(x,lambda)-log(x)/lambda
```

The following two commands will generate two histograms. Print out each and describe what you see and why the two graphs are different.

```
>hist(invexp(testdata,3))
```

```
>hist(invexp(testdata,10))
```

Try to play around with the commands above and try different numbers of random numbers, for example, generating 1000 or 10 uniform numbers with the runif command.

Section 2 (graded) from Devore, 7th edition: Exercises

5.1.7, 5.1.13, 5.2.29, 5.2.35, 5.3.37, 5.3.38, 5.3.41.