Assessment

There are many probability distributions and this same type of examination can be performed with all of them!

Here’s mathematical representation for an exponential probability distribution:



where λ is a parameter that controls the shape of the probability distribution. This parameter is greater than 0 in value.

Note that E(Y) = 1/λ and Var(Y) = 1/λ2.

Complete the following with λ = 1:

1. Plot the probability distribution using curve() and dexp() to find f(y). The rate argument of dexp() is λ. Note that you will likely need to look at the help for dexp() to determine how exactly to use this function.
2. Simulate 1,000 observations from a population characterized by this probability distribution with the help of the rexp() function. Set a seed number of 8324 right before you simulate the observations. Create a histogram for these observations and include a plot of the exponential probability distribution on it.
3. Simulate 1,000 different samples of size 30 using the exponential probability distribution. Find the sample mean for each sample. Determine if a normal distribution approximation works well for the sample mean. Below is the code that you can use to simulate these samples and find the sample means.

n <- 30

set.seed(8129)

set1 <- matrix(data = rexp(n = 1000\*n, rate = 1), nrow =

1000, ncol = n)

ybar <- rowMeans(set1)

head(round(ybar,2))

1. Find the mean and variance for ybar. Are these similar to what would be expected? Remember that  and  should be as given in the course notes.
2. Find the approximate value for  using the central limit theorem and by examining the proportion of ybar values are less than 0.6422. Are they similar?
3. Determine the effect that other sample sizes have on the sample mean. What is a good sample size to use for the normal distribution approximation to work well when the population is characterized by an exponential probability distribution?

While this assessment will not be turned in for a grade, you may see this or similar problems on projects, quizzes, and/or tests. If you have any questions about this assessment, please ask during our lab!