**Stat 6045 Home Work 3**

**Due Date: Wednesday, September 30, 2020.**

**Directions:** *Please submit a copy of your brief answers and description as well as your R code (in txt file) with a description for the functions using (# the comment command in R). Please submit the homework before 8:30 PM. Late homework is NOT accepted.*

*1.* The Monty Hall problem is a brain teaser, in the form of a [probability](https://en.wikipedia.org/wiki/Probability) puzzle ([Gruber, Krauss and others](https://en.wikipedia.org/wiki/Monty_Hall_problem#refKraussandWang2003)), loosely based on the American television game show [*Let's Make a Deal*](https://en.wikipedia.org/wiki/Let%27s_Make_a_Deal) and named after its original host, [Monty Hall](https://en.wikipedia.org/wiki/Monty_Hall).

Suppose you're on a game show, and you're given the choice of three doors: Behind one door is a car; behind the others, goats. You pick a door, say No. 1, and the host, who knows what's behind the doors, opens another door, say No. 3, which has a goat. He then says to you, "Do you want to pick door No. 2?" Is it to your advantage to switch your choice?

1. Conduct a simulation study where you will find the probability of winning if you switch the door. Present the simulation study in a functional format where you can choose the total number of trials (n). Clearly describe the steps of the algorithm. Before answer think carefully the problem!
2. For this problem construct the real 95% interval for the probability of winning the car when you switch for different number of trials. Conduct the simulation study for different n=2,10,100,1000. (Hint: You must choose the number of samples n and the number of iterations m to construct a confidence interval for the case).
3. Us the normal approximation ( ) to construct a 95% confidence interval for the probability of winning the car when you switch. Use the similar simulation technique as at the end of your class notes (chapter 3) to find what is the exact Confidence Interval you are constructing for n=2,10,100,1000. Conduct the simulation study for different n=5,10,100,1000. (Hint: You can choose m=1000 for this case).

*2.* Take a look at the ChickWeight data – Simply use:

require(graphics)

ChickWeight

You can also find information in the web for these data. Do some exploration of the different fields and their qualities. For parts (a)-(e), use the base R function only (i.e. without loading the lattice package).

(a) Do a basic scatter plot of the logarithm of chick-weight against age. What are the limitations of this?

(b) Use color to distinguish between the different diets.

(c) What is the range of log-weights and ages? [I'll let you guess the command for this one.]

(d) Using this, construct a new (blank) plot window with these ranges, and add x-and y-axes.

(e) Now plot an individual line for each chick's measurements, with color corresponding to the diet they were given.

Do you see any further shortcomings in this plot?

(f) Can you achieve the same plot using lattice?

(g) Export your final plot to a PDF file.

3.Answer the following question using the function,

Plot f (x, y) using filled.contour() in the region [-2,6]x[-2,6]. Draw the 3D graph for the function and rotate it in a 45 degree angle.

*4. Create the world's most dazzling graph. Using several different plotting options create a graph that is ashy, colorful, gaudy and completely informative. Your graph should at a minimum include,*

*\* Two plot regions*

*\* Three different plotting symbols*

*\*Three different line types*

*\*Three different colors*

*\*Text in the outer margin, figure margin and plot region*

*\* Math expression*

*\*Two different looking axes*

*\*Legend*