library(readr)  
data=read\_csv("https://raw.githubusercontent.com/JA-McLean/STOR455/master/data/SleepStudy.csv")

## Rows: 253 Columns: 27

## -- Column specification --------------------------------------------------------  
## Delimiter: ","  
## chr (5): LarkOwl, DepressionStatus, AnxietyStatus, Stress, AlcoholUse  
## dbl (22): Gender, ClassYear, NumEarlyClass, EarlyClass, GPA, ClassesMissed, ...

##   
## i Use `spec()` to retrieve the full column specification for this data.  
## i Specify the column types or set `show\_col\_types = FALSE` to quiet this message.

1. Construct an ANOVA model for the mean AverageSleep value using LarkOwl and DepressionStatus as factors along with the interaction term and show the summary output. Is there evidence for a significant difference in mean AverageSleep values for any of the predictors?

amod1= aov(GPA~factor(ClassYear)+DepressionStatus+factor(ClassYear)\*DepressionStatus,data=data)  
summary(amod1)

## Df Sum Sq Mean Sq F value Pr(>F)   
## factor(ClassYear) 3 5.13 1.7109 11.606 3.93e-07 \*\*\*  
## DepressionStatus 2 0.22 0.1105 0.750 0.474   
## factor(ClassYear):DepressionStatus 6 0.31 0.0514 0.349 0.910   
## Residuals 241 35.53 0.1474   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

There is evidence for a significant difference in the mean AverageSleep value between class years but not for depression status or the interaction term.

1. Perform pairwise comparisons using Tukey HSD methods to show where any significant differences may occur among factors that showed a significant difference in part a).

hsd = TukeyHSD(amod1)  
hsd$`factor(ClassYear)`[,4][hsd$`factor(ClassYear)`[,4]<.05] #significant differences in means between class groups

## 2-1 3-1 4-1   
## 9.727889e-08 3.285752e-04 6.721431e-04

There appear to be significant differences in mean AverageSleep values between class years 1:2, 1:3, and 1:4.

1. Produce 95% family-wise confidence level plots for the ANOVA model created in part a).

hsd=TukeyHSD(amod1)  
 plot(hsd,las=2)

