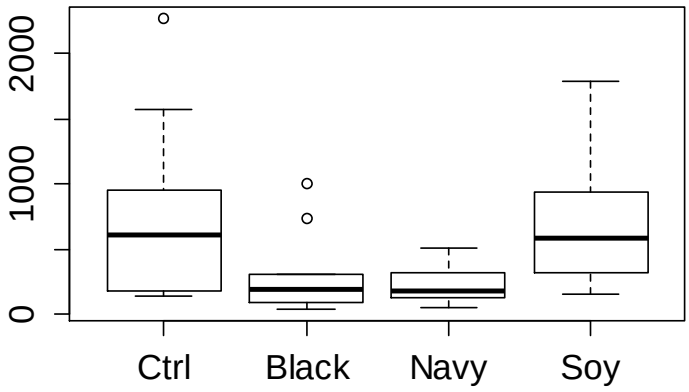
STAT511 HW#7 KEY
32 points total, 2 points per problem unless otherwise noted.

#1 Dog Diets ANOVA

A. Boxplots



B. ANOVA Table (Original Scale)

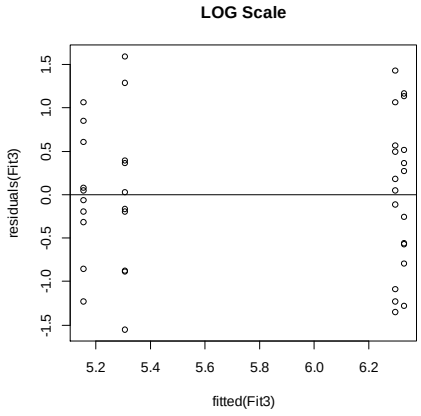
```
             Df Sum Sq Mean Sq F value   Pr(>F)
Diet          3 2623607  874536   3.723 0.0198 *
Residuals    36 8457190  234922
```

C. ANOVA Assumptions (**4 pts**)
From the plot of residuals vs fitted values, we see a clear megaphone shape indicating that the assumption of equal variances is NOT satisfied.

From the qqplot of residuals, we see curvature indicating that the assumption of normality is NOT satisfied.

D. Levene's test p-value = 0.0484. Reject H0; we cannot conclude equal variances.

E. Log Transformation



F. ANOVA (after log transformation)

```
             Df Sum Sq Mean Sq F value   Pr(>F)
Diet          3  11.80   3.934   5.137 0.00464 **
Residuals    36  27.57   0.766
```

p-value < 0.05
Reject H0 and conclude not all the means are the same

G. Unadjusted pairwise comparisons

```
                   Estimate Std. Error t value Pr(>|t|)
Black - Ctrl == 0 -0.98818    0.39133  -2.525  0.01611 *
Navy - Ctrl == 0  -1.14118    0.39133  -2.916  0.00607 **
Soy - Ctrl == 0    0.03198    0.39133   0.082  0.93532
Navy - Black == 0 -0.15300    0.39133  -0.391  0.69813
Soy - Black == 0   1.02016    0.39133   2.607  0.01321 *
Soy - Navy == 0    1.17316    0.39133   2.998  0.00490 **
```

H. Tukey Comparisons

```
                   Estimate Std. Error t value Pr(>|t|)
Black - Ctrl == 0 -0.98818    0.39133  -2.525   0.0731 .
Navy - Ctrl == 0  -1.14118    0.39133  -2.916   0.0295 *
Soy - Ctrl == 0    0.03198    0.39133   0.082   0.9998
Navy - Black == 0 -0.15300    0.39133  -0.391   0.9794
Soy - Black == 0   1.02016    0.39133   2.607   0.0606 .
Soy - Navy == 0    1.17316    0.39133   2.998   0.0242 *
```

I. HSD= 1.05415

J. "Lines" display

```
    Navy    Black     Ctrl     Soy
5.155598 5.308594 6.296778 6.328757
```

K. Dunnetts' Comparisons

```
                   Estimate Std. Error t value Pr(>|t|)
Black - Ctrl == 0 -0.98818    0.39133  -2.525   0.0421 *
Navy - Ctrl == 0  -1.14118    0.39133  -2.916   0.0166 *
Soy - Ctrl == 0    0.03198    0.39133   0.082   0.9996
```

L. Contrasts (**8 pts**)

```
DietCtrl  DietBlack   DietNavy    DietSoy
    6.297      5.309      5.156      6.329

         Estimate Std. Error t value Pr(>|t|)
```

```
     C1 == 0   0.1530     0.3913   0.391 0.698129
     C2 == 0  -1.0647     0.3389  -3.142 0.003354 **
     C3 == 0  -1.0967     0.3389  -3.236 0.002602 **
     C4 == 0  -1.0807     0.2767  -3.905 0.000397 ***
```

```
#R Code
#Q1
Diets <-
read.csv("C:/hess/STAT511_FA11/HW_2015/HW7/DogDiets.csv")
Diets <- data.frame(Diets, sqrtTrig = sqrt(Diets$Trig), logTrig
= log(Diets$Trig))
str(Diets)
levels(Diets$Diet)
Diets$Diet <- factor(Diets$Diet, levels(Diets$Diet)[c(2, 1, 3,
4)])
#Original Scale
boxplot(Trig ~ Diet, data = Diets)
Fit1 <- aov(Trig ~ Diet, data = Diets)
summary(Fit1)
plot(Fit1)
plot(residuals(Fit1) ~ fitted(Fit21), main = "Original
Scale");abline(h=0)
library(car)
leveneTest(Trig ~ Diet, data = Diets)
#SQRT Scale
Fit2 <- aov(sqrtTrig ~ Diet, data = Diets)
plot(residuals(Fit2) ~ fitted(Fit2), main = "SQRT
Scale");abline(h=0)
leveneTest(sqrtTrig ~ Diet, data = Diets)
#LOG Scale
Fit3 <- aov(logTrig ~ Diet, data = Diets)
plot(residuals(Fit3) ~ fitted(Fit3), main = "LOG
Scale");abline(h=0)
leveneTest(logTrig ~ Diet, data = Diets)
summary(Fit3)
#Pairwise Comparisons (G-K)
library(multcomp)
PairComps <- glht(Fit3, linfct = mcp(Diet = "Tukey"))
summary(PairComps, test = adjusted(type = "none"))
summary(PairComp)
HSD <- qtukey(0.95, 4, 36)*sqrt(0.766/10)
cld(PairComps)
DunnettComps <- glht(Fit3, linfct = mcp(Diet = "Dunnett"))
summary(DunnettComps)
#Contrasts (L)
C1 <- c(0, 1, -1, 0)
```

```
C2 <- c(-1, 0.5, 0.5, 0)
C3 <- c(0, 0.5, 0.5, -1)
C4 <- c(-0.5, 0.5, 0.5, -0.5)
Cmat <- t(cbind(C1, C2, C3, C4))
colnames(Cmat) <- c("Ctrl", "Black", "Navy", "Soy")
Fit4 <- lm(logTrig ~ Diet - 1, data = Diets)
Fit4
contresults <- glht(Fit4, linfct = Cmat)
contresults
summary(contresults, test = adjusted(type= "none"))
```