STAT 512 HW2

32 points Total, 2 points per question unless otherwise noted.

1. Correlations

```
          BodyFat   Triceps     Thigh    Midarm
BodyFat 1.0000000 0.8432654 0.8780896 0.1424440
Triceps 0.8432654 1.0000000 0.9238425 0.4577772
Thigh   0.8780896 0.9238425 1.0000000 0.0846675
Midarm  0.1424440 0.4577772 0.0846675 1.0000000
```

2. Full Model

```
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  117.085     99.782   1.173    0.258
Triceps        4.334      3.016   1.437    0.170
Thigh         -2.857      2.582  -1.106    0.285
Midarm        -2.186      1.595  -1.370    0.190

Multiple R-squared:  0.8014
```

3. 95% Confidence Intervals

```
                 2.5 %     97.5 %
(Intercept) -94.444550 328.613940
Triceps      -2.058507  10.726691
Thigh        -8.330476   2.616780
Midarm       -5.568367   1.196247
```

4. (**4 pts**) Full Model test H_0: $\beta_1 = \beta_2 = \beta_3 = 0$
   Test statistic: F = 21.52
   p-value = 7.343e-06 < 0.001
   Reject H0; conclude that at least one of the partial regression coefficients is different from zero.

5. (**4 pts**) Test H_0: $\beta_2 = 0$ AND $\beta_3 = 0$.
   Test Statistic F = 3.6352
   p-value = 0.04995
   Reject H0; conclude that at least one of the betas are different from zero.

6. (**4 pts**) Final Model

```
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   6.7916     4.4883   1.513   0.1486
Triceps       1.0006     0.1282   7.803 5.12e-07 ***
Midarm       -0.4314     0.1766  -2.443   0.0258 *

Multiple R-squared:  0.7862
```

7. Thigh was is highly correlated with Triceps.

8. (**4 pts**) Diagnostic Plots
   A. Plot of residuals versus fitted values shows equal scatter and no trend, supporting the assumptions of equal variance and linearity.
   B. QQplot of residuals is roughly linear, supporting the assumption of normality.

9. (**4 pts**)
   A. Predicted value: 16.01728
   B. 95% Confidence interval: (14.25175, 17.7828)
   C. 95% Prediction interval: (10.46253, 21.57202)

10. (**4 pts**) Outlier Test for Obs #13
    Rstudent = -1.818
    Unadjusted p-value = 0.0878
    Bonferonni p-value = 1
    Fail to Reject H0; cannot conclude the observation is an outlier.

R Code:

```
library(car)
InData <- read.csv("C:/hess/STAT512/HW_2019/HW2/BodyFat.csv")
#1
cor(InData)
pairs(InData)
#2,4
Model1 <- lm(BodyFat ~ ., data = InData)
summary(Model1)
#4
Confint(Model1
#5
c2 <- matrix(c(0,0,1,0,
               0,0,0,1), nrow=2, byrow = TRUE)
lht(Model1, c2, rhs = c(0,0))
ModelQ5 <- lm(BodyFat ~ Triceps, data = InData)
anova(ModelQ5, Model1)
#6
Model2 <- lm(BodyFat ~ Triceps + Midarm, data = InData)
summary(Model2)
#8
plot(Model2)
#9
NewData <- data.frame(Triceps=20, Midarm = 25)
predict(Model2, NewData, interval = "confidence")
predict(Model2, NewData, interval = "prediction")
#10
outlierTest(Model2)
```