Week 8: Practice Exam #3

Instructions: This is the first of three practice exams leading up to the final exam. Complete the analysis specified below by writing and running the appropriate R-code.

The built-in “trees” data set contains three variables:  
Girth: Tree diameter in inches (measured 4.5 feet off the ground)  
Height: Height in ft  
Volume: Volume of timber in cubic ft  
  
Review those three variables with the appropriate diagnostics.   
> summary(trees)

Girth Height Volume

Min. : 8.30 Min. :63 Min. :10.20

1st Qu.:11.05 1st Qu.:72 1st Qu.:19.40

Median :12.90 Median :76 Median :24.20

Mean :13.25 Mean :76 Mean :30.17

3rd Qu.:15.25 3rd Qu.:80 3rd Qu.:37.30

Max. :20.60 Max. :87 Max. :77.00

1. Make any necessary transformations of the variables.

tree\_scale<-scale(trees)

tree\_scale<-as.data.frame(tree\_scale)

Develop a regression model that predicts Volume from Girth and Height. Paste the outputs below.  
> lm1 <- lm(Volume~Girth\*Height, data=tree\_scale)

> summary(lm1)

Call:

lm(formula = Volume ~ Girth \* Height, data = tree\_scale)

Residuals:

Min 1Q Median 3Q Max

-0.40042 -0.06493 0.01841 0.09515 0.28379

Coefficients:

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

(Intercept) -0.08231 0.03313 -2.484 0.0195 \*

Girth 0.83578 0.03701 22.585 < 2e-16 \*\*\*

Height 0.18873 0.03669 5.143 2.07e-05 \*\*\*

Girth:Height 0.16380 0.02965 5.524 7.48e-06 \*\*\*

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.1648 on 27 degrees of freedom

Multiple R-squared: 0.9756, Adjusted R-squared: 0.9728

F-statistic: 359.3 on 3 and 27 DF, p-value: < 2.2e-16

1. Provide a brief written interpretation of the results.

The results of this model indicate we are able to explain 97% (p<.001) of the variance in tree volume by height and girth using the adjusted r-squared due to the multiple (x) predicters. Both of our independent variables Girth (.836, p<.001) and Height (.189, p<.001) are significant. Girth is the stronger predictor of the two using the scaled values to compare apple trees to apple trees 😊 There is a significant interaction between girth and height (.164,p<.001).

#Code

data("trees")

summary(trees)

tree\_scale<-scale(trees)

tree\_scale<-as.data.frame(tree\_scale)

lm1 <- lm(Volume~Girth\*Height, data=tree\_scale)

summary(lm1)

library(car)

vif(lm1)