ECS 132 Group Quiz

Bowei Jia, Ethan Wang, Alan Sin, Yangzihao Wang

March 10, 2016

Problem 1

Set up the dummy variable:

```
J <- as.integer(ToothGrowth$supp == "OJ")
```

Fit the model:

```
lmout<-lm(ToothGrowth$len ~ J + ToothGrowth$dose)
summary(lmout)
```

The output of the summary(lmout):

```
Call:
lm(formula = ToothGrowth$len ~ J + ToothGrowth$dose)

Residuals:
Min      1Q  Median      3Q     Max
-6.600  -3.700   0.373   2.116   8.800

Coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept)         5.5725     1.2824   4.345 5.79e-05 ***
J                   3.7000     1.0936   3.383   0.0013 **
ToothGrowth$dose    9.7636     0.8768  11.135 6.31e-16 ***
---
Signif. codes:  0    ***    0.001    **    0.01    *    0.05    .    0.1

Residual standard error: 4.236 on 57 degrees of freedom
Multiple R-squared:  0.7038,    Adjusted R-squared:  0.6934
F-statistic: 67.72 on 2 and 57 DF,  p-value: 8.716e-16
```

The linear model is:

$$mean\_length = 5.5725 + 3.7000J + 9.7636dose$$

where β_0 is 5.5725, β_1 is 3.7000, and β_2 is 5.5725.

Problem 2

$$\begin{aligned} P_T(2) &= P_T(Y = 1|X = 1) + P_T(Y = 0|X = 2) \\ &= 0.5 \cdot 0.5 \cdot 2 \cdot 0.5 + 0.5 \cdot 0.5 \cdot 0.5 \cdot 0.5 \\ &= 0.3125 \end{aligned}$$

Problem 3

```
pval <- function(x, p0) {
    phat <- mean(x)
    Z <- (phat - p0)/sqrt(p0*(1-p0)/length(x))
    2*(1-pnorm(Z,0.1))
}
```

Problem 4

```
qpqinv <-function(lmout) {
    error <- coef(summary(lmout))[, "Std. Error"]
    cov <- vcov(lmout)
    result = cov/error**2
}
```