Problem Set 2

lalonde <- read.csv("lalonde.csv", header = TRUE)  
attach(lalonde)  
  
install.packages("lmtest")  
library(lmtest)  
  
install.packages("sandwich")  
library(sandwich)

#### 1.

prob1 <- lm(re78 ~ treat)  
summary(prob1)

Average Treatment Effect: 1793.6 S.E.: 632.9 Confidence Interval: (553.116, 3034.084)

#### 2.

coeftest(prob1, vcov = sandwich)

Average Treatment Effect: 1793.61 S.E.: 669.33 Confidence Interval: (481.7232, 3105.4968)

#### 3.

**i)**

True

Given that E(u∣X) = 0,

Definition of Covariance,

Cov(X,u) = E[(X − E[X])(u − E[u])]  
  
 = E[Xu − XE[u] − E[X]u + E[X]E[u]]  
   
 = E[Xu] − E[X]E[u] − E[X]E[u] + E[X]E[u]  
   
 = E[Xu] − E[X]E[u]  
   
 = E[Xu] − E[X]E[E[u∣X]]  
   
 = E[Xu] − E[X]E[0]  
   
 = E[Xu]  
   
 = E[E[Xu∣X]]  
   
 = E[XE[u∣X]]  
   
 = E[X\*0]

**ii)**

**iii)**

#### 4.

**i)**

**ii)**

**iii)**

#### 5.

**i)**

**ii)**

**iii)**