> setwd("C:/Users/HS/Documents/GitHub/Multivariate-Statistical-Analysis")

> college<-read.csv("college.csv")[,-c(1)]

> head(college)

X1 X2 X3

1 468 41 26

2 428 39 26

3 514 53 21

4 547 67 33

5 614 61 27

6 501 67 29

> summary(college)

X1 X2 X3

Min. :348.0 Min. :25.00 Min. :14.00

1st Qu.:477.5 1st Qu.:48.00 1st Qu.:21.00

Median :521.0 Median :55.00 Median :26.00

Mean :526.6 Mean :54.69 Mean :25.13

3rd Qu.:583.5 3rd Qu.:64.00 3rd Qu.:28.00

Max. :733.0 Max. :75.00 Max. :36.00

**> #1(a)**

> # Hotelling T-test

> x.bar<-colMeans(college)

> mu.0<-matrix(c(500,50,30),ncol=1)

> S<-var(college)

> n<-nrow(college)

> p<-ncol(college)

> alpha<-0.05

> x.bar;mu.0;S;n;p

X1 X2 X3

526.58621 54.68966 25.12644

[,1]

[1,] 500

[2,] 50

[3,] 30

X1 X2 X3

X1 5808.0593 597.83520 222.02967

X2 597.8352 126.05373 23.38853

X3 222.0297 23.38853 23.11173

[1] 87

[1] 3

> T2<-n\*t(x.bar-mu.0)%\*%solve(S)%\*%(x.bar-mu.0)

> T2

[,1]

[1,] 223.3102

> T2\*(n-p)/((n-1)\*p)

[,1]

[1,] 72.70564

> p.value <- 1-pf(T2\*(n-p)/((n-1)\*p),p,n-p)

> p.value

[,1]

[1,] 0

> crit.val<-(n-1)\*p/(n-p)\*qf(1-alpha,p,n-p)

> crit.val

[1] 8.333483

> T2>crit.val

[,1]

[1,] TRUE

#reject the hypothesis at the level of alpha 0.05