Here is the R code for Example 7.10 on p 397. The output it produces is also shown in the next section.

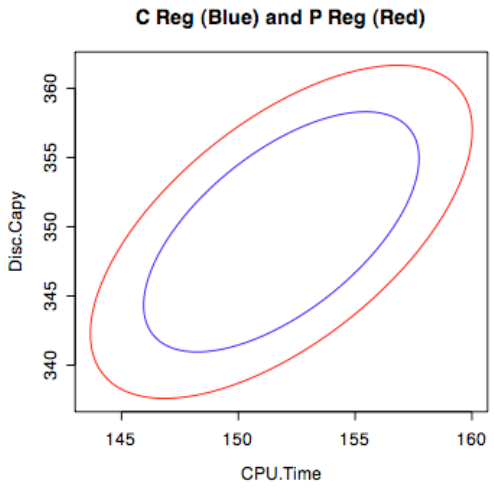
```
attach(E7.10.df)
lm.out=lm(cbind(CPU.Time,Disc.Capy)~Orders+Add.Del)
attributes(lm.out)
coeffs=lm.out[[1]]
coeffs
preds=lm.out[[5]]
z0=c(1,130,7.5)
z0%*%coeffs[,1]
z0%*%coeffs[,2]
z=cbind(rep(1,7),Orders,Add.Del)
z
term=t(z0)%*%ginv(t(z)%*%z)%*%z0
term
expand=as.numeric(((1+term)/term)^.5)
expand
nsigma=matrix(c(5.8,5.22,5.22,12.56),ncol=2)
plot(ellipse(expand*nsigma,centre=c(151.84,349.63)),type="l",main="C Reg (Blue) and
P Reg (Red)",xlab="CPU.Time",ylab="Disc.Capy",col="red")
lines(ellipse(nsigma,centre=c(151.84,349.63)),col="blue")
```

```
> attach(E7.10.df)
> lm.out=lm(cbind(CPU.Time,Disc.Capy)~Orders+Add.Del)
> attributes(lm.out)
$names
 [1] "coefficients"  "residuals"
 [3] "effects"       "rank"
 [5] "fitted.values" "assign"
 [7] "qr"            "df.residual"
 [9] "xlevels"       "call"
[11] "terms"         "model"

$class
[1] "mlm" "lm"

> coeffs=lm.out[[1]]
> coeffs
            CPU.Time Disc.Capy
(Intercept) 8.4236890 14.141491
Orders      1.0789825  2.253854
Add.Del     0.4198885  5.665367
```

```
> preds=lm.out[[5]]
> z0=c(1,130,7.5)
> z0%*%coeffs[,1]
        [,1]
[1,] 151.8406
> z0%*%coeffs[,2]
        [,1]
[1,] 349.6327
> z=cbind(rep(1,7),Orders,Add.Del)
> z
      Orders Add.Del
[1,] 1  123.5   2.108
[2,] 1  146.1   9.213
[3,] 1  133.9   1.905
[4,] 1  128.5   0.815
[5,] 1  151.5   1.061
[6,] 1  136.2   8.603
[7,] 1   92.0   1.125
> term=t(z0)%*%ginv(t(z)%*%z)%*%z0
> term
         [,1]
[1,] 0.3699502
> expand=as.numeric(((1+term)/term)^.5)
> expand
[1] 1.924335
> nsigma=matrix(c(5.8,5.22,5.22,12.56),ncol=2)
> plot(ellipse(expand*nsigma,centre=c(151.84,349.63)),type="l",main="C Reg (Blue)
and P Reg (Red)",xlab="CPU.Time",ylab="Disc.Capy",col="red")
> lines(ellipse(nsigma,centre=c(151.84,349.63)),col="blue")
```



Its easy once you have spent a few hours nitpicking!