Multivariate Analysis

Homework 2

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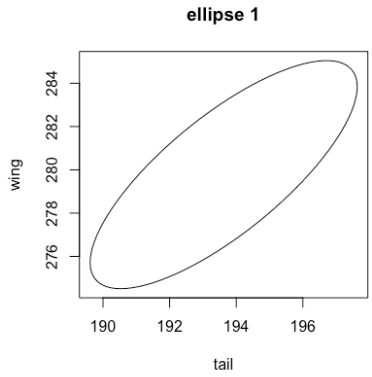
5.20. (a) For the null hypothesis is that the mean vector is equal to (190, 275), the p-value is bigger than 0.05 so that we don't reject the null hypothesis.



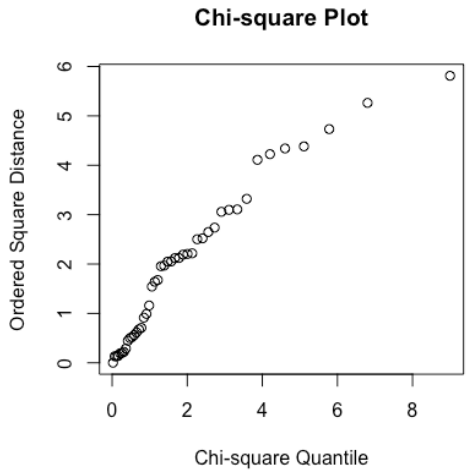

```
        Hotelling's one sample T2-test

data:  t(t(Bird) - c(190, 275))
T.2 = 2.7086, df1 = 2, df2 = 43, p-value = 0.078
alternative hypothesis: true location is not equal to c(0,0)
```

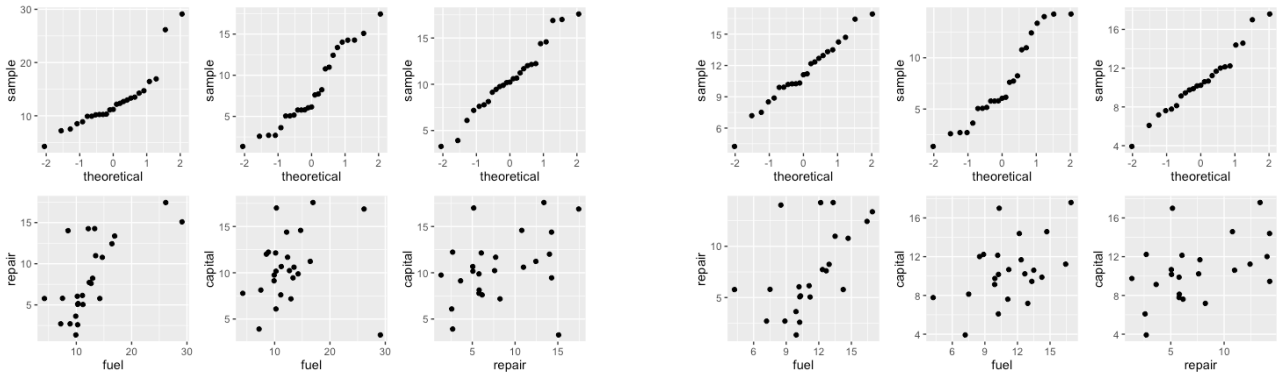
(b) The confidence interval of the T-square is wider than the one of the Bonferroni. Bonferonni is better for its narrower CI.

```
> CI.20
                lower    upper
Bonf of Tail 189.8216 197.4229
Bonf of Wing 274.7819 284.7736
T-sq of Tail 189.4217 197.8227
T-sq of Wing 274.2564 285.2992
```

(c) From the chi-square plot, it performs a straight line, so we believe that the data is bivariate normal.



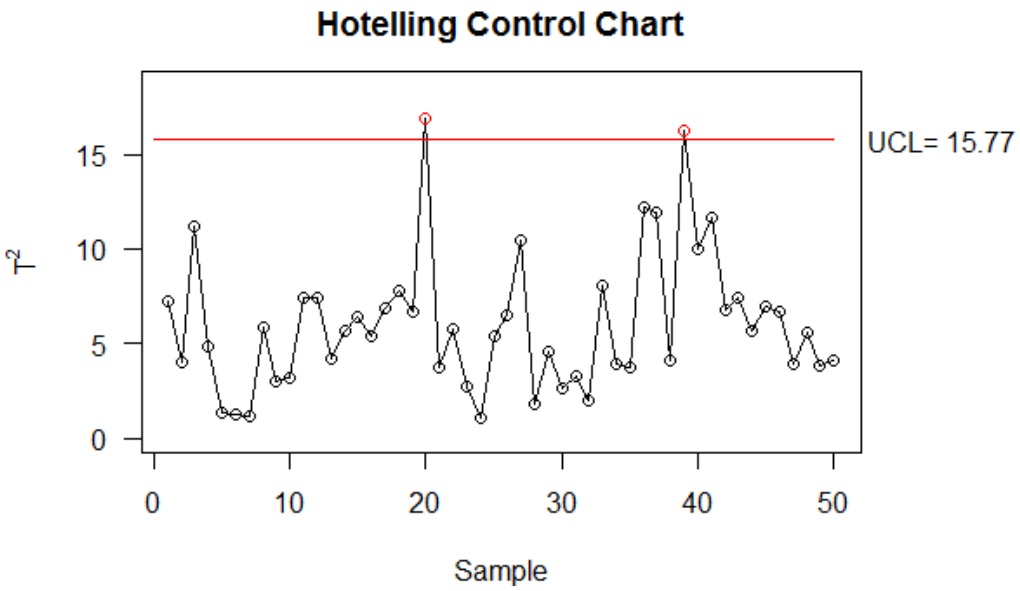
5.22. (a) The Q-Q plot of the data with outliers eliminated (the right figure) is more like a straight line. That is the new data is more like a normal distribution.



(b) Bonferonni intervals are always narrower than the t-square CI.

```
> CI.22.1
                      lower    upper
Bonf of Fuel     9.789733 15.33027
Bonf of Repair   5.777122 10.54528
Bonf of Capital 8.646243 12.44256
T-sq of Fuel     9.159708 15.96029
T-sq of Repair   5.234926 11.08747
T-sq of Capital 8.214557 12.87424
> CI.22.2
                      lower     upper
Bonf of Fuel     9.709644 12.788617
Bonf of Repair   5.347498  9.565546
Bonf of Capital 8.908147 12.260548
T-sq of Fuel     9.359528 13.138733
T-sq of Repair   4.867855 10.045188
T-sq of Capital 8.526939 12.641756
```

5.28. There are two samples is out of control so that we need to notice them.



5.29. By the test statistics, we reject the null hypothesis.

```
> 30*A%*%solve(S)%*%t(A)
         [,1]
[1,] 374.7227
> (((30-1)*6)/(30-6))*qf(0.05,6,24,lower.tail = F)
[1] 18.18437
>
> 30*A%*%solve(S)%*%t(A)>(((30-1)*6)/(30-6))*qf(0.05,6,24,lower.tail = F)
     [,1]
[1,] TRUE
```