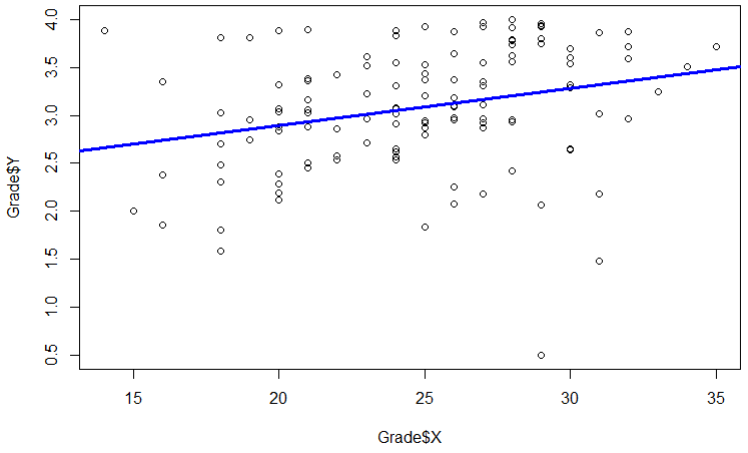
```
> setwd("C:/Users/user/Desktop/迴歸分析/")
>
> #(1)
> Grade <- read.table("Grade_Point_Average.csv", sep =
",", skip = 1)
> colnames(Grade) <- c("Y", "X")
> #(a)
> Grade
      Y  X
1   3.897 21
2   3.885 14
3   3.778 28
4   2.540 22
5   3.028 21
6   3.865 31
7   2.962 32
8   3.961 27
9   0.500 29
10  3.178 26
11  3.310 24
12  3.538 30
13  3.083 24
14  3.013 24
15  3.245 33
16  2.963 27
17  3.522 25
18  3.013 31
19  2.947 25
20  2.118 20
21  2.563 24
```

22 3.357 21
23 3.731 28
24 3.925 27
25 3.556 28
26 3.101 26
27 2.420 28
28 2.579 22
29 3.871 26
30 3.060 21
31 3.927 25
32 2.375 16
33 2.929 28
34 3.375 26
35 2.857 22
36 3.072 24
37 3.381 21
38 3.290 30
39 3.549 27
40 3.646 26
41 2.978 26
42 2.654 30
43 2.540 24
44 2.250 26
45 2.069 29
46 2.617 24
47 2.183 31
48 2.000 15
49 2.952 19
50 3.806 18
51 2.871 27
52 3.352 16
53 3.305 27
54 2.952 26

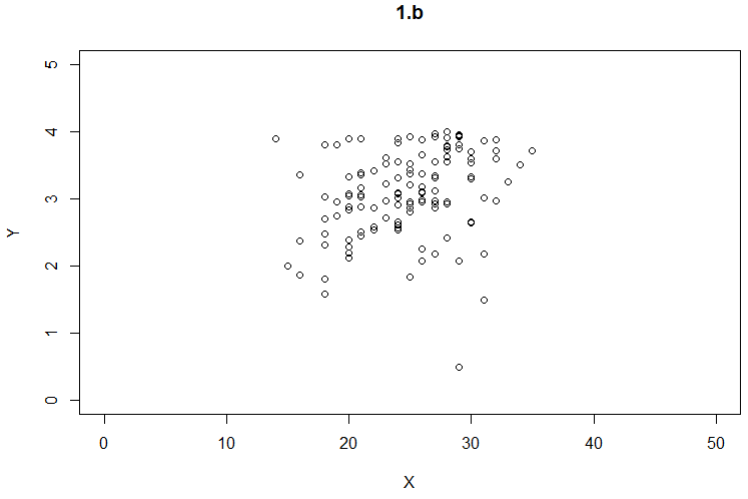
55	3.547	24
56	3.691	30
57	3.160	21
58	2.194	20
59	3.323	30
60	3.936	29
61	2.922	25
62	2.716	23
63	3.370	25
64	3.606	23
65	2.642	30
66	2.452	21
67	2.655	24
68	3.714	32
69	1.806	18
70	3.516	23
71	3.039	20
72	2.966	23
73	2.482	18
74	2.700	18
75	3.920	29
76	2.834	20
77	3.222	23
78	3.084	26
79	4.000	28
80	3.511	34
81	3.323	20
82	3.072	20
83	2.079	26
84	3.875	32
85	3.208	25
86	2.920	27
87	3.345	27

88 3.956 29
89 3.808 19
90 2.506 21
91 3.886 24
92 2.183 27
93 3.429 25
94 3.024 18
95 3.750 29
96 3.833 24
97 3.113 27
98 2.875 21
99 2.747 19
100 2.311 18
101 1.841 25
102 1.583 18
103 2.879 20
104 3.591 32
105 2.914 24
106 3.716 35
107 2.800 25
108 3.621 28
109 3.792 28
110 2.867 25
111 3.419 22
112 3.600 30
113 2.394 20
114 2.286 20
115 1.486 31
116 3.885 20
117 3.800 29
118 3.914 28
119 1.860 16
120 2.948 28

```
> Grade_lsfit <- lsfit(Grade$X, Grade$Y)
> Toluca_Company_lsfit$coefficients
Intercept         X
62.365859  3.570202
>
> b0 <- Toluca_Company_lsfit$coefficients[1]
> b0
Intercept
62.36586
> b1 <- Toluca_Company_lsfit$coefficients[2]
> b1
      X
3.570202
>
> #The least squares estimates of β0 is 62.365859 and β1
is 3.570202.
> #The estimated regression function is
Y^=62.365859+3.570202X
>
> #(b)
> plot(Grade$X, Grade$Y)
> abline(lm(Y ~ X, data = Grade), col = 'blue', lwd = 3)
>
```



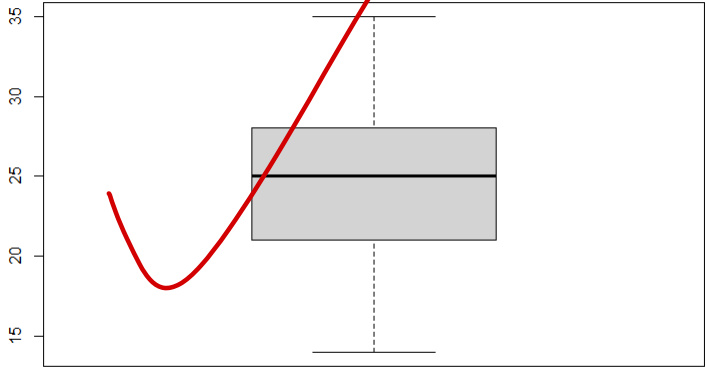
> plot(X, Y, main = "1.b", xlim = c(0, 50), ylim = c(0, 5))



> #From the above picture, the estimated regression function appear to fit the data well.
>
> #(c)
> hat_Y <- 62.365859 + 6.570202 * 30

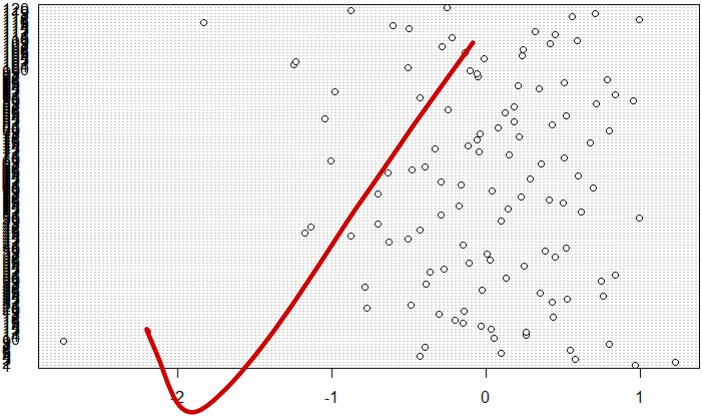
```
> hat_Y
[1] 259.4719
> #The point estimate of the mean freshman GPA for
students with ACT test score X=30 is 3.27895.
>
> #(2)
> Grade <- read.table("Grade_Point_Average.csv", sep =
",", skip = 1)
> colnames(Grade) <- c("Y", "X")
> #(a)
> Grade.lm <- lm(Grade$Y~Grade$X, data = Grade)
> summary.aov(Grade.lm)
             Df Sum Sq Mean Sq F value  Pr(>F)
Grade$X       1  3.59   3.588    9.24 0.00292 **
Residuals   118 45.82   0.388
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
>
> #(b)
> # H0: beta1 = 0
> # H1: beta1 is not equal to 0
> # Full Model: Yi = beta0 + beta1 Xi + epsilon_i
> Full_model <- Grade.lm
>
> # Reduced Model: Yi = beta0 + epsilon_i
> Reduced_model <- lm(Grade$Y ~ 1, data =
Toluca_Company)
>
> # Test Statistic: F* = MSR / MSE
> anova(Reduced_model, Full_model)[2, 5]
[1] 9.240243
> qf(0.99, 1, 118)
[1] 6.854641
```

```
> #Decision Rule:if F* > F(0.99;1,118)= 6.854641, reject
H0
> #Conclusion:We conclude to reject H0. beta1 is not
equal to 0.
>
> #(c)
> Grade_Anova <- anova(Grade.lm)
> MSE <- Grade_Anova$`Mean Sq`[2]
> MSE
[1] 0.3882848
>
> #(3)
> Grade2 <- read.table("Grade_Point_Average_X.csv",
sep = ",", skip = 1)
> colnames(Grade2) <- c("Y", "X1", "X2", "X3")
>
> #(a)
> boxplot(Grade2$X1)
```

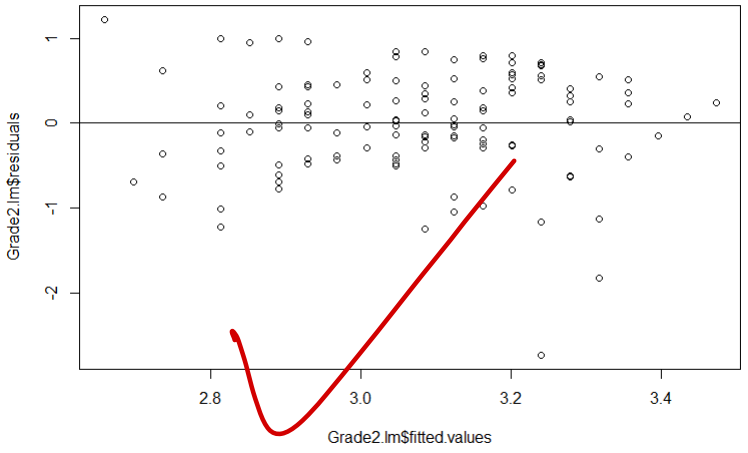



```
>
```

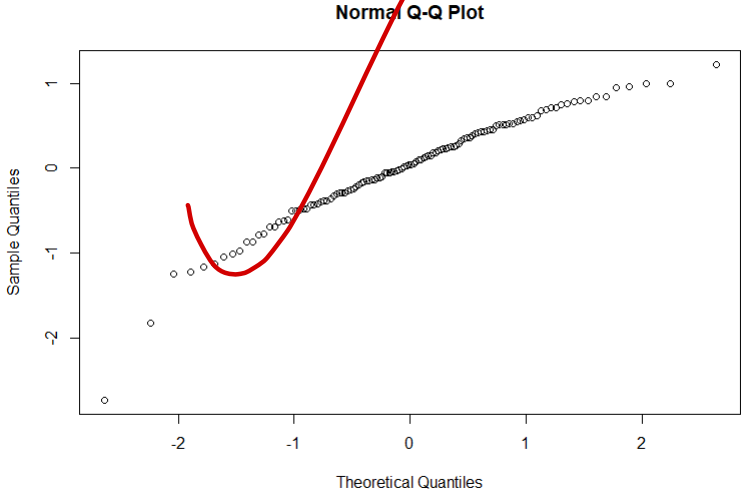
```
> #(b)
> Grade2.lm <- lm(Grade2$Y~Grade2$X1, data =
Grade2)
> dotchart(Grade2.lm$residuals)
```




```
>
> #(c)
> plot(Grade2.lm$fitted.values, Grade2.lm$residuals)
> abline(h=0)
>
```

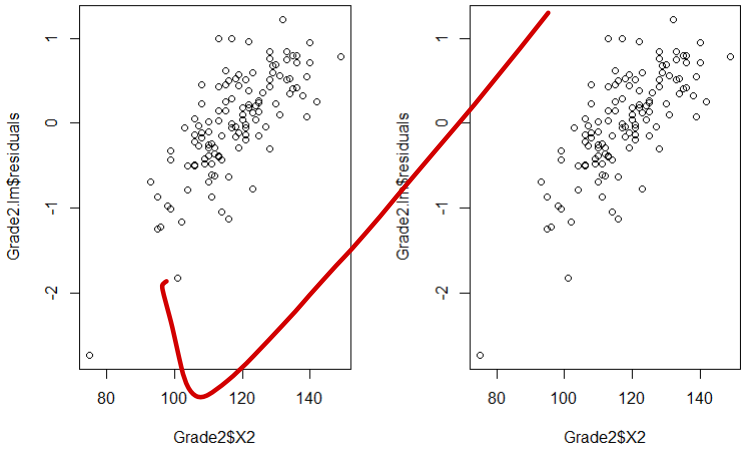



```
> #
>
> #(d)
> qqnorm(Grade2.lm$residuals)
```

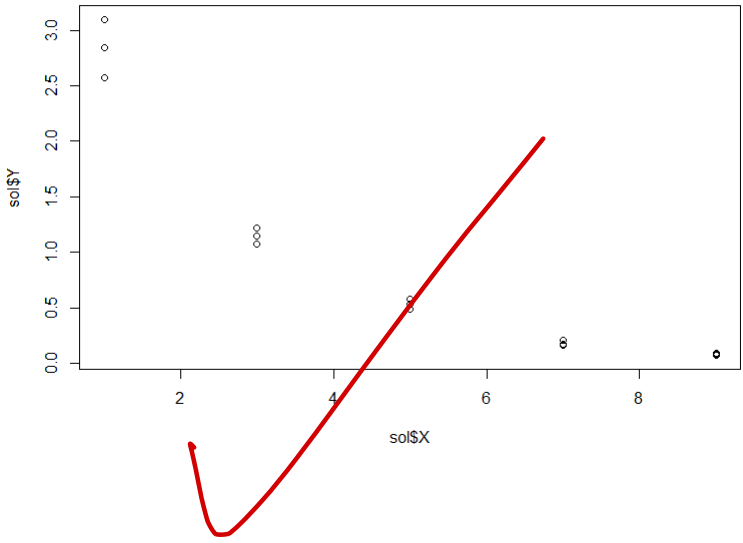



```
> cor(Grade2$X1, Grade2$Y)
[1] 0.2694818
```

```
>
> #Conciusion:
>
> #(e)
> group <- ifelse(Grade2$X1 < 26, "A", "B")
>
> library(ALSM)
> bftest(Grade2.lm, group)
     t.value  P.Value alpha  df
[1,] 0.8967448 0.371681  0.05 118
> qt(0.995, 118)
[1] 2.618137
> #Decision Rule:if abs(t*BF) > t(0.995, 118)=2.618137,
reject H0
> #Conclusion:We conclude to accept H0. The error
variance is constant.
>
> #(f)
> par(mfrow = c(1, 2))
> plot(Grade2$X2, Grade2.lm$residuals)
> plot(Grade2$X2, Grade2.lm$residuals)
>
```




```
> #4
> sol <- read.table("Solution_concentration.csv", sep =
","", skip = 1)
> colnames(sol) <- c("Y", "X")
> #(a)
> plot(sol$X, sol$Y)
```


sol$Y
0.0
0.5
1.0
1.5
2.0
2.5
3.0
2
4
6
8
sol$X