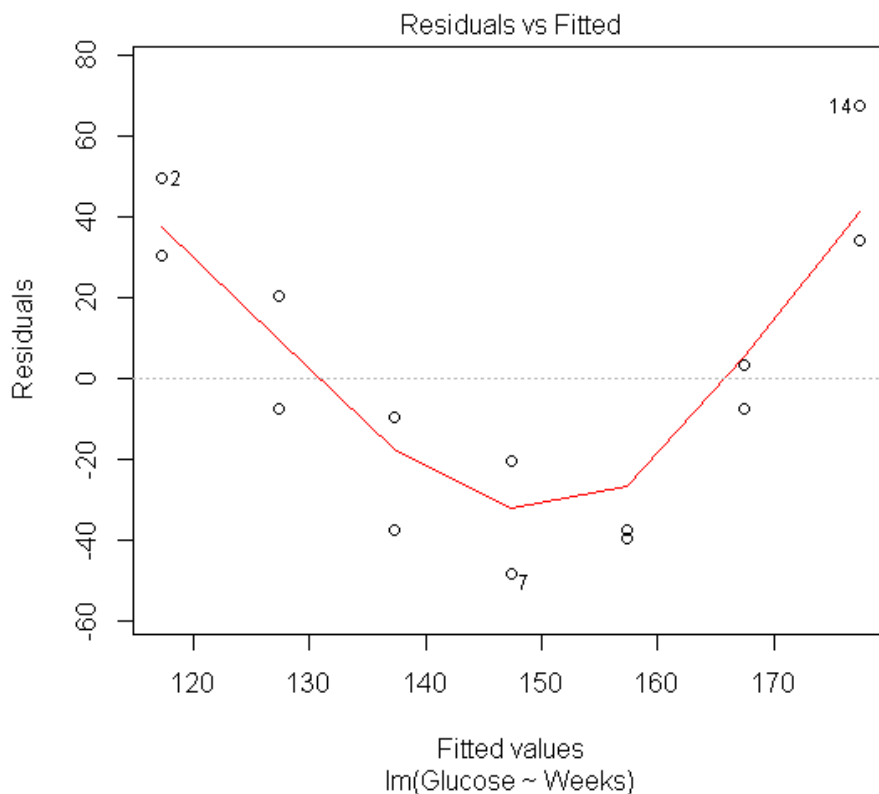


R Output for the Practice Final Examination

Question 1

```
> potatoes <- read.csv("potatoes.csv", header=T)
> potatoes
  Glucose Weeks
1    148     2
2    167     2
3    120     5
4    148     5
5    100     8
6    128     8
7     99    11
8    127    11
9    118    14
10   120    14
11   160    17
12   171    17
13   212    20
14   245    20
> attach(potatoes)
>
> summary(potatoes)
  Glucose      Weeks
Min.   : 99.0   Min.   : 2.00
1st Qu.: 120.0  1st Qu.: 5.75
Median : 138.0  Median : 11.00
Mean   : 147.4  Mean   : 11.00
3rd Qu.: 165.2  3rd Qu.: 16.25
Max.   : 245.0  Max.   : 20.00
>
> potatoes.lm <- lm(Glucose ~ Weeks)
> plot(potatoes.lm, which=1)
```



STAT2008/4038/6038 REGRESSION MODELLING

R Output for the Practice Final Examination

Question 1 continued

```
> var(potatoes)
      Glucose      Weeks
Glucose 1734.4011 129.69231
Weeks   129.6923  38.76923
```

```
> summary(potatoes.lm)
```

```
Call:
lm(formula = Glucose ~ Weeks)
```

```
Residuals:
    Min       1Q   Median       3Q      Max
-48.357 -33.080  -7.357  28.241  67.536
```

```
Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  110.560    20.950   5.277 0.000195 ***
Weeks         3.345     1.672   2.001 0.068562 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 37.54 on 12 degrees of freedom
Multiple R-squared:  0.2501,    Adjusted R-squared:  0.1877
F-statistic: ? on ? and ? DF,  p-value: ?
```

```
>
> Weeks.sqd <- Weeks^2
> potatoes.lm2 <- lm(Glucose ~ Weeks + Weeks.sqd)
>
> summary(potatoes.lm2)
```

```
Call:
lm(formula = Glucose ~ Weeks + Weeks.sqd)
```

```
Residuals:
    Min       1Q   Median       3Q      Max
-15.619 -10.839  -7.357  13.446  21.167
```

```
Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  198.1455    13.7219  14.44 1.70e-08 ***
Weeks        -19.3241     2.8971  -6.67 3.51e-05 ***
Weeks.sqd     1.0304     0.1282   8.04 6.23e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 14.95 on 11 degrees of freedom
Multiple R-squared:  0.891,    Adjusted R-squared:  0.8711
F-statistic: 44.94 on 2 and 11 DF,  p-value: 5.09e-06
```

R Output for the Practice Final Examination

Question 2

```
> trees <- read.csv("trees.csv", header=T)
> trees
```

	Diameter	Height	Volume
1	8.3	70	10.3
2	8.6	65	10.3
3	8.8	63	10.2
4	10.5	72	16.4
5	10.7	81	18.8
6	10.8	83	19.7
7	11.0	66	15.6
8	11.0	75	18.2
9	11.1	80	22.6
10	11.2	75	19.9
11	11.3	79	24.2
12	11.4	76	21.0
13	11.4	76	21.4
14	11.7	69	21.3
15	12.0	75	19.1
16	12.9	74	22.2
17	12.9	85	33.8
18	13.3	86	27.4
19	13.7	71	25.7
20	13.8	64	24.9
21	14.0	78	34.5
22	14.2	80	31.7
23	14.5	74	36.3
24	16.0	72	38.3
25	16.3	77	42.6
26	17.3	81	55.4
27	17.5	82	55.7
28	17.9	80	58.3
29	18.0	80	51.5
30	18.0	80	51.0
31	20.6	87	77.0

```
> attach(trees)
>
> log_Volume <- log(Volume)
> trees.lm <- lm(log_Volume ~ Diameter + Height)
> plot(fitted(trees.lm), rstudent(trees.lm), main="Residuals vs Fitted")
> abline(0, 0, lty=2)
>
> plot(trees.lm, which=4)
>
> # Plots shown on page 5
>
> anova(trees.lm)
```

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Diameter	1	7.8077	7.8077	833.969	< 2.2e-16 ***
Height	1	0.2388	0.2388	25.511	2.414e-05 ***
Residuals	28	0.2621	0.0094		

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

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R Output for the Practice Final Examination

Question 2 continued

```
> summary(trees.lm)
```

Call:

```
lm(formula = log_Volume ~ Diameter + Height)
```

Residuals:

Min	1Q	Median	3Q	Max
-0.177279	-0.086019	-0.009928	0.058914	0.170011

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.102585	0.215315	0.476	0.637
Diameter	0.145290	0.006587	22.057	< 2e-16 ***
Height	0.016385	0.003244	5.051	2.41e-05 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.09676 on 28 degrees of freedom

Multiple R-squared: 0.9684, Adjusted R-squared: 0.9662

F-statistic: 429.7 on 2 and 28 DF, p-value: < 2.2e-16

```
> Radius_ft <- Diameter/24
> log_Radius <- log(Radius_ft)
> log_Height <- log(Height)
> trees.lm2 <- lm(log_Volume ~ log_Radius + log_Height)
> plot(fitted(trees.lm2), rstudent(trees.lm2), main="Residuals vs Fitted")
> abline(0,0,lty=2)
```

```
> plot(trees.lm2, which=4) # Plots shown on page 6
```

```
> anova(trees.lm2)
```

Analysis of Variance Table

Response: log_Volume

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
log_Radius	1	7.9254	7.9254	1196.53	< 2.2e-16 ***
log_Height	1	0.1978	0.1978	29.86	7.805e-06 ***
Residuals	28	0.1855	0.0066		

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```
> summary(trees.lm2)
```

Call:

```
lm(formula = log_Volume ~ log_Radius + log_Height)
```

Residuals:

Min	1Q	Median	3Q	Max
-0.168561	-0.048488	0.002431	0.063637	0.129223

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	-0.33065	0.91031	-0.363	0.719
log_Radius	1.98265	0.07501	26.432	< 2e-16 ***
log_Height	1.11712	0.20444	5.464	7.81e-06 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.08139 on 28 degrees of freedom

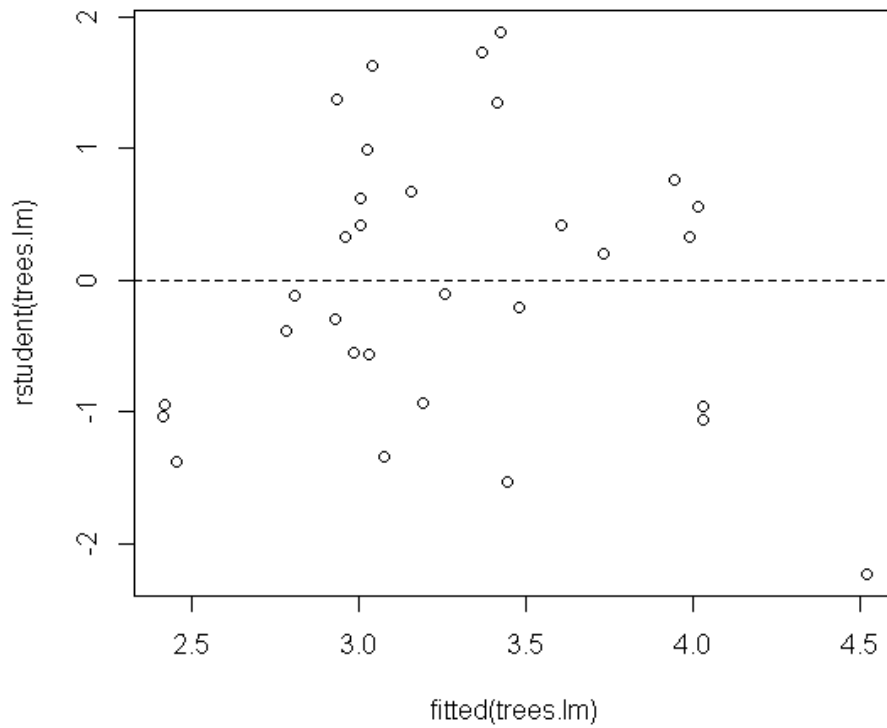
Multiple R-squared: 0.9777, Adjusted R-squared: 0.9761

F-statistic: 613.2 on 2 and 28 DF, p-value: < 2.2e-16

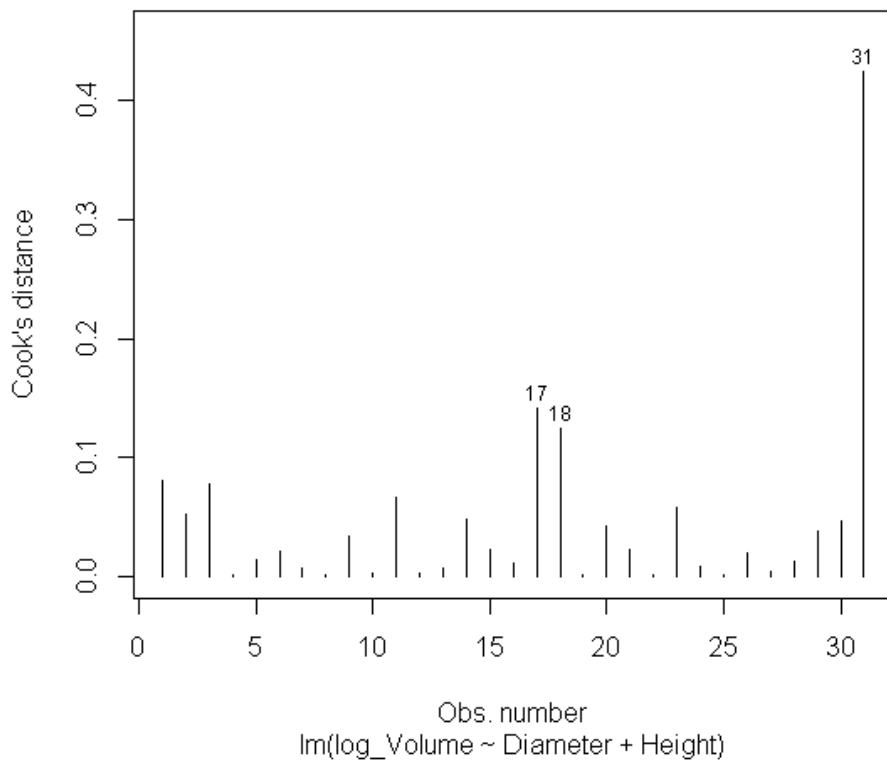
R Output for the Practice Final Examination

Question 2 continued (plots for *trees.lm*)

Residuals vs Fitted



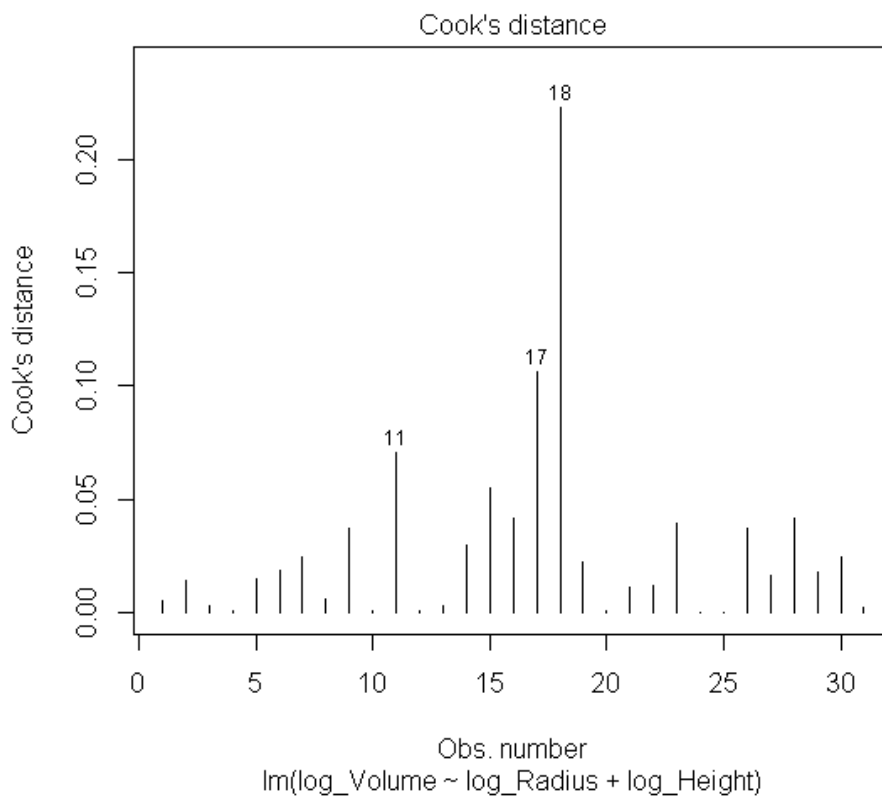
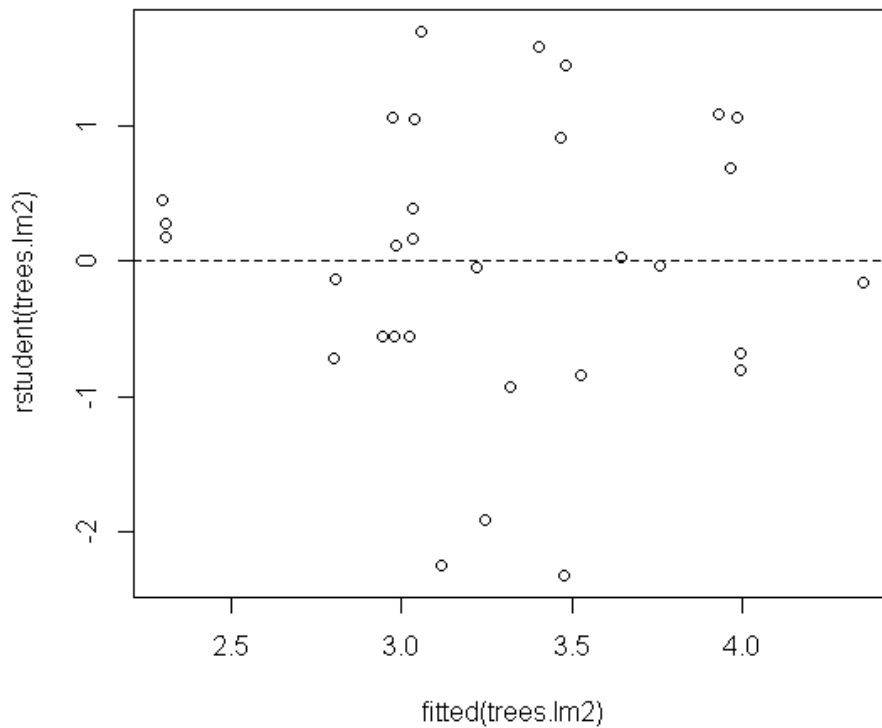
Cook's distance



R Output for the Practice Final Examination

Question 2 continued (plots for *trees.lm2*)

Residuals vs Fitted



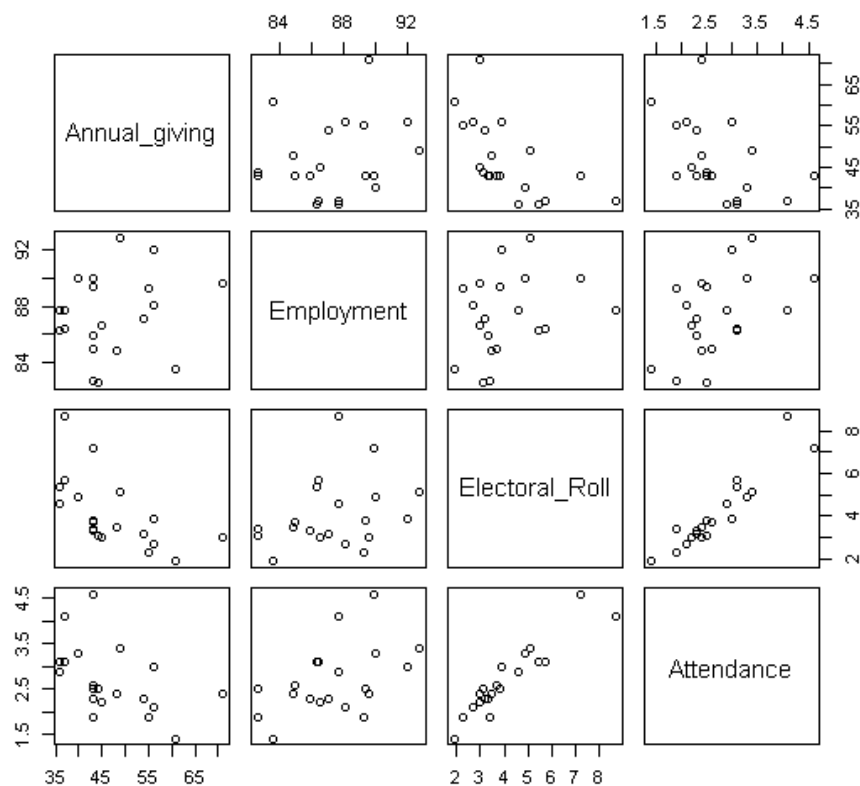
R Output for the Practice Final Examination

Question 3

```
> church <- read.csv("church.csv", header=T)
> church
```

	Annual_giving	Employment	Electoral_Roll	Attendance
1	43	89.9	7.2	4.6
2	61	83.6	1.9	1.4
3	37	86.4	5.7	3.1
4	54	87.1	3.2	2.3
5	71	89.6	3.0	2.4
6	37	87.7	8.7	4.1
7	55	89.3	2.3	1.9
8	43	85.0	3.7	2.6
9	43	82.7	3.4	1.9
10	49	92.8	5.1	3.4
11	48	84.9	3.5	2.4
12	36	86.3	5.4	3.1
13	44	82.6	3.1	2.5
14	43	85.9	3.3	2.3
15	56	92.0	3.9	3.0
16	43	89.4	3.8	2.5
17	36	87.7	4.6	2.9
18	56	88.1	2.7	2.1
19	45	86.6	3.0	2.2
20	40	90.0	4.9	3.3

```
> pairs(church)
```



R Output for the Practice Final Examination

Question 3 continued

```
> attach(church)
>
> church.lm1 <- lm(Annual_giving ~ Employment + Electoral_Roll + Attendance)
>
> anova(church.lm1)
```

Analysis of Variance Table

```
Response: Annual_giving
      Df Sum Sq Mean Sq F value Pr(>F)
Employment    1  63.58   63.58   1.2847 0.273723
Electoral_Roll 1 777.98  777.98  15.7192 0.001111 **
Attendance    1   2.57    2.57   0.0519 0.822615
Residuals    16 791.87   49.49
```

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
>
> library(faraway)
> vif(church.lm1)
      Employment Electoral_Roll Attendance
      1.675467      9.314186      11.089371
```

```
>
> church.lm2 <- lm(Annual_giving ~ Electoral_Roll + Attendance + Employment)
>
> anova(church.lm2)
```

Analysis of Variance Table

```
Response: Annual_giving
      Df Sum Sq Mean Sq F value Pr(>F)
Electoral_Roll 1 589.65  589.65  11.9140 0.003282 **
Attendance    1  64.60   64.60   1.3052 0.270067
Employment    1 189.88  189.88   3.8367 0.067809 .
Residuals    16 791.87   49.49
```

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
>
> church.lm3 <- lm(Annual_giving ~ Attendance + Employment + Electoral_Roll)
>
> anova(church.lm3)
```

Analysis of Variance Table

```
Response: Annual_giving
      Df Sum Sq Mean Sq F value Pr(>F)
Attendance    1 382.70  382.70   7.7326 0.01336 *
Employment    1 396.43  396.43   8.0101 0.01206 *
Electoral_Roll 1  64.99   64.99   1.3132 0.26866
Residuals    16 791.87   49.49
```

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```


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R Output for the Practice Final Examination

Question 3 continued

```
> church.lm2a <- lm(Annual_giving ~ Electoral_Roll + Employment + Attendance)
>
> anova(church.lm2a)
Analysis of Variance Table
```

```
Response: Annual_giving
      Df Sum Sq Mean Sq F value    Pr(>F)
Electoral_Roll  1  589.65   589.65  11.9140  0.003282 **
Employment      1  251.91   251.91   5.0900  0.038413 *
Attendance      1    2.57     2.57   0.0519  0.822615
Residuals     16  791.87    49.49
```

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
> church.lm2b <- lm(Annual_giving ~ Electoral_Roll + Employment)
>
> anova(church.lm2b)
Analysis of Variance Table
```

```
Response: Annual_giving
      Df Sum Sq Mean Sq F value    Pr(>F)
Electoral_Roll  1  589.65   589.65  12.6176  0.002451 **
Employment      1  251.91   251.91   5.3906  0.032923 *
Residuals     17  794.44    46.73
```

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
>
> vif(church.lm2b)
Electoral_Roll      Employment
      1.096005      1.096005
>
> summary(church.lm2b)
```

```
Call:
lm(formula = Annual_giving ~ Electoral_Roll + Employment)
```

```
Residuals:
    Min       1Q   Median       3Q      Max
-9.503 -4.636 -1.010  2.672 16.526
```

```
Coefficients:
      Estimate Std. Error t value Pr(>|t|)
(Intercept)  -53.7670     49.4977  -1.086  0.292531
Electoral_Roll -4.0128      0.9835  -4.080  0.000779 ***
Employment      1.3424      0.5782   2.322  0.032923 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: ? on ? degrees of freedom
Multiple R-squared:  ?, Adjusted R-squared:  ?
F-statistic: ? on ? and ? DF, p-value: ?
```

R Output for the Practice Final Examination

Question 4

```

> help(gal.a)
> attach(gal.a)
>
> Island <- row.names(gal.a)
> data.frame(Island, gal.a, row.names=1:30)

```

	Island	Species	Endemics	Area	Elevation	Nearest	Scruz	Adjacent
1	Baltra	58	23	25.09	346	0.6	0.6	1.84
2	Bartolome	31	21	1.24	109	0.6	26.3	572.33
3	Caldwell	3	3	0.21	114	2.8	58.7	0.78
4	Champion	25	9	0.10	46	1.9	47.4	0.18
5	Coamano	2	1	0.05	77	1.9	1.9	903.82
6	Daphne. Major	18	11	0.34	119	8.0	8.0	1.84
7	Daphne. Minor	24	0	0.08	93	6.0	12.0	0.34
8	Darwin	10	7	2.33	168	34.1	290.2	2.85
9	Eden	8	4	0.03	71	0.4	0.4	17.95
10	Enderby	2	2	0.18	112	2.6	50.2	0.10
11	Espanola	97	26	58.27	198	1.1	88.3	0.57
12	Fernandina	93	35	634.49	1494	4.3	95.3	4669.32
13	Gardner1	58	17	0.57	49	1.1	93.1	58.27
14	Gardner2	5	4	0.78	227	4.6	62.2	0.21
15	Genovesa	40	19	17.35	76	47.4	92.2	129.49
16	Isabela	347	89	4669.32	1707	0.7	28.1	634.49
17	Marchena	51	23	129.49	343	29.1	85.9	59.56
18	Onslow	2	2	0.01	25	3.3	45.9	0.10
19	Pinta	104	37	59.56	777	29.1	119.6	129.49
20	Pinzon	108	33	17.95	458	10.7	10.7	0.03
21	Las. Plazas	12	9	0.23	94	0.5	0.6	25.09
22	Rabida	70	30	4.89	367	4.4	24.4	572.33
23	SanCristobal	280	65	551.62	716	45.2	66.6	0.57
24	SanSalvador	237	81	572.33	906	0.2	19.8	4.89
25	SantaCruz	444	95	903.82	864	0.6	0.0	0.52
26	SantaFe	62	28	24.08	259	16.5	16.5	0.52
27	SantaMaria	285	73	170.92	640	2.6	49.2	0.10
28	Seymour	44	16	1.84	147	0.6	9.6	25.09
29	Tortuga	16	8	1.24	186	6.8	50.9	17.95
30	Wolf	21	12	2.85	253	34.1	254.7	2.33

```

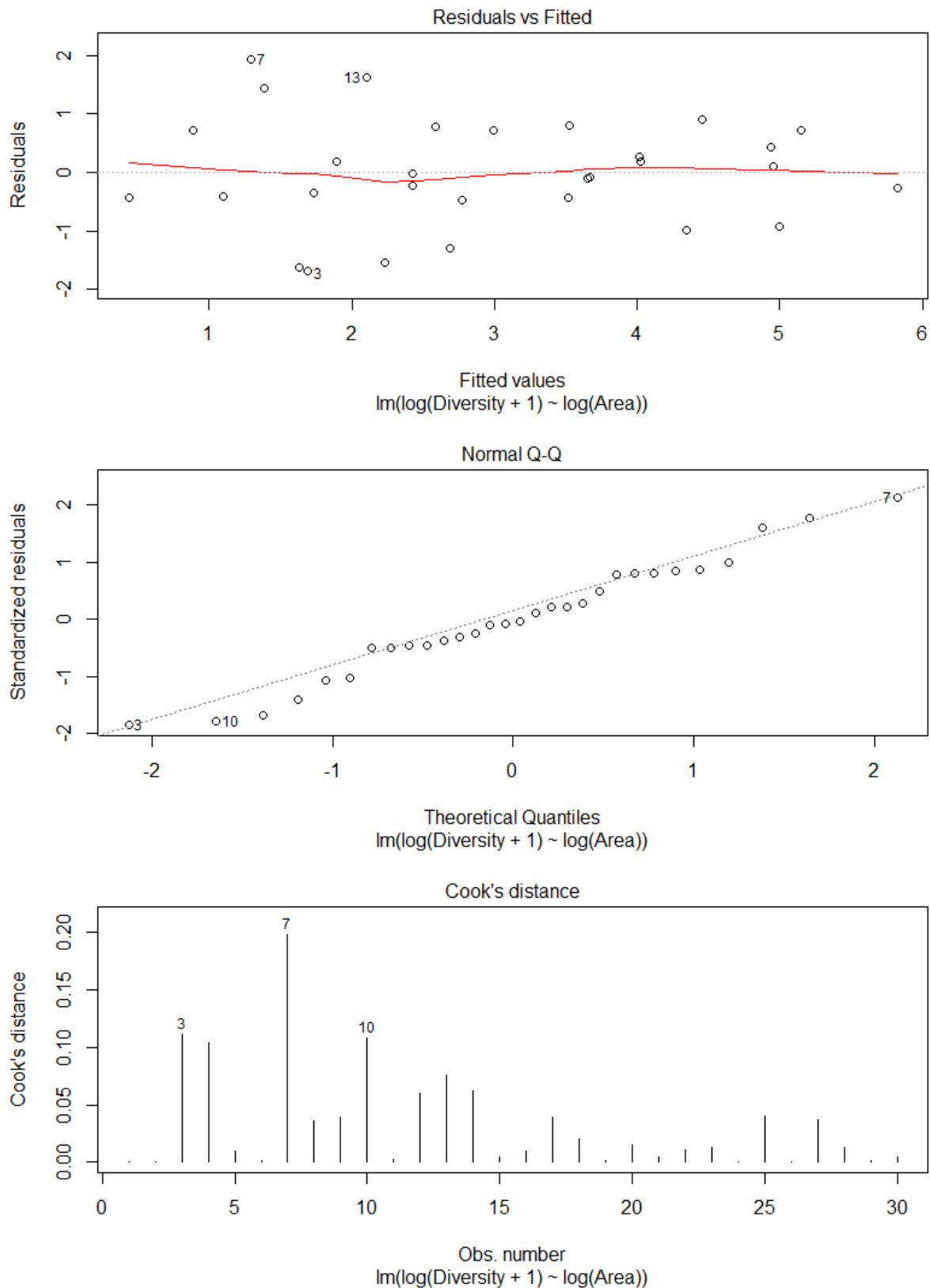
>
> Diversity <- Species - Endemics
> gal.a.lm <- lm(log(Diversity+1) ~ log(Area) + Elevation + Nearest + Scruz
+ log(Adjacent))
>
> anova(gal.a.lm)
Analysis of Variance Table

Response: log(Diversity + 1)
          Df Sum Sq Mean Sq F value    Pr(>F)
log(Area)  1  60.554   60.554  67.9065 1.861e-08 ***
Elevation  1   0.139    0.139   0.1557  0.6966
Nearest    1   1.599    1.599   1.7934  0.1931
Scruz      1   1.621    1.621   1.8183  0.1901
log(Adjacent) 1   0.052    0.052   0.0583  0.8112
Residuals 24  21.401    0.892
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
>
> gal.a.lm2 <- lm(log(Diversity+1) ~ log(Area))
> plot(gal.a.lm2, which=c(1, 2, 4))

```

R Output for the Practice Final Examination

Question 4 continued



STAT2008/4038/6038 REGRESSION MODELLING

R Output for the Practice Final Examination

Question 4 continued

```
> anova(gal.a.lm2)
Analysis of Variance Table

Response: log(Diversity + 1)
      Df Sum Sq Mean Sq F value    Pr(>F)    
log(Area)  1 60.554   60.554   68.332 5.379e-09 ***
Residuals 28 24.813    0.886                      
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

>
> summary(gal.a.lm2)

Call:
lm(formula = log(Diversity + 1) ~ log(Area))

Residuals:
    Min       1Q   Median       3Q      Max
-1.69183 -0.43206 -0.05479  0.71870  1.92541

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  2.33602     0.18858  12.388 7.01e-13 ***
log(Area)    0.41277     0.04993   8.266 5.38e-09 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.9414 on 28 degrees of freedom
Multiple R-squared:  0.7093,    Adjusted R-squared:  0.699 
F-statistic: 68.33 on 1 and 28 DF,  p-value: 5.379e-09

> mean(log(Area))
[1] 1.554093
>
> var(log(Area))
[1] 12.25517
>
par(mfrow=c(2, 2))

plot(residuals(lm(Elevation ~ log(Area))), residuals(gal.a.lm2))
abline(0, lm(log(Diversity+1) ~ log(Area) + Elevation)$coef[3])
abline(h=0, lty=2)

plot(residuals(lm(Nearest ~ log(Area))), residuals(gal.a.lm2))
abline(0, lm(log(Diversity+1) ~ log(Area) + Nearest)$coef[3])
abline(h=0, lty=2)

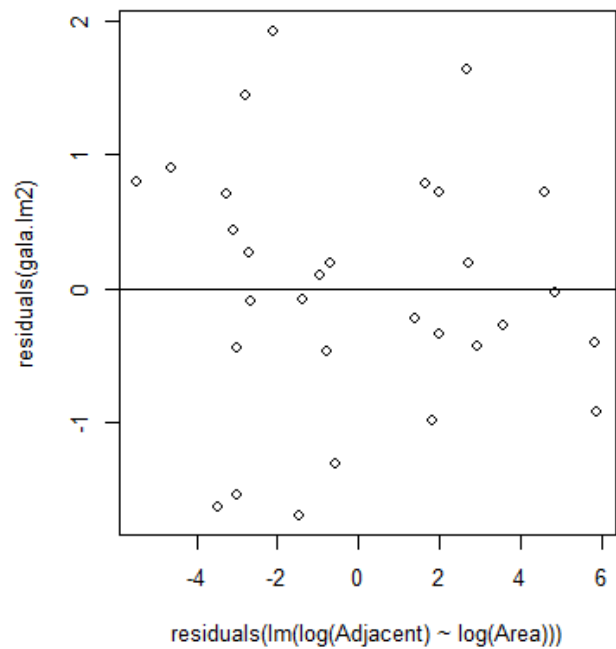
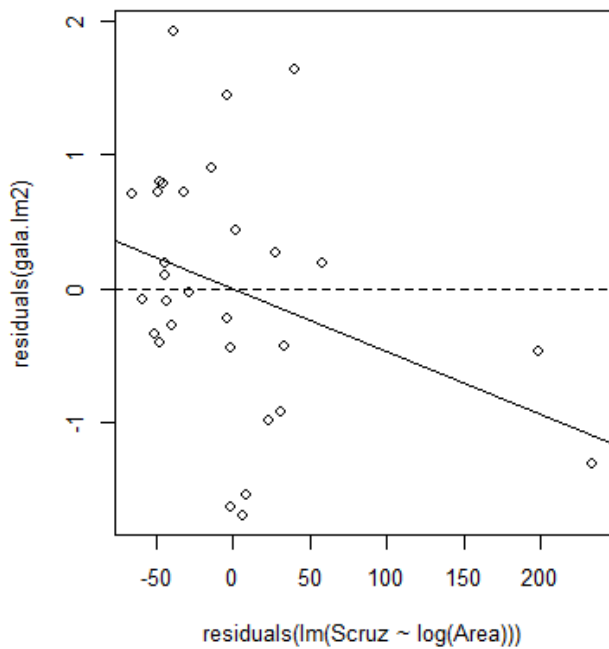
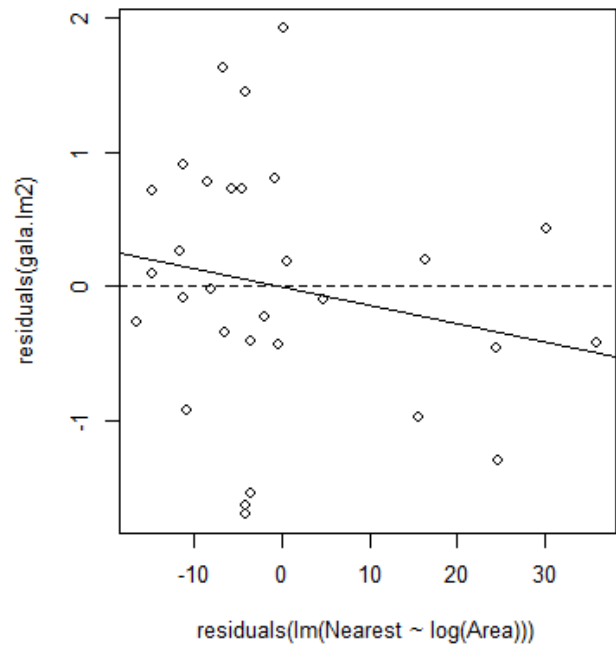
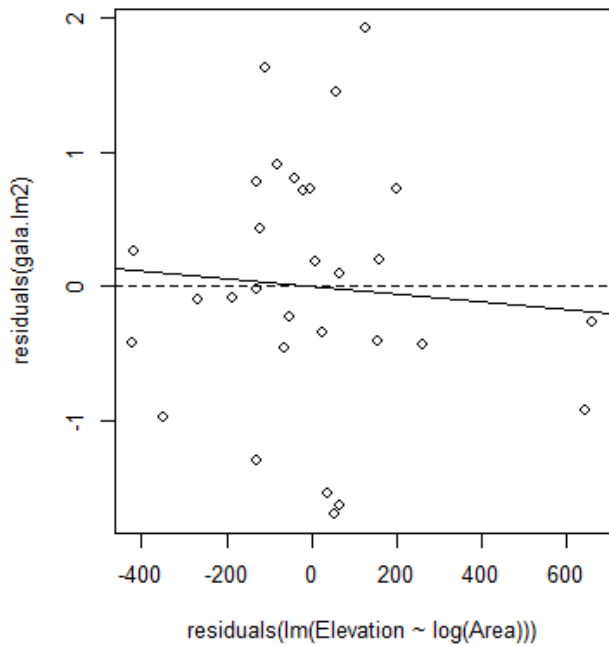
plot(residuals(lm(Scruz ~ log(Area))), residuals(gal.a.lm2))
abline(0, lm(log(Diversity+1) ~ log(Area) + Scruz)$coef[3])
abline(h=0, lty=2)

plot(residuals(lm(log(Adjacent) ~ log(Area))), residuals(gal.a.lm2))
abline(0, lm(log(Diversity+1) ~ log(Area) + Adjacent)$coef[3])
abline(h=0, lty=2)

par(mfrow=c(1, 1))
```

R Output for the Practice Final Examination

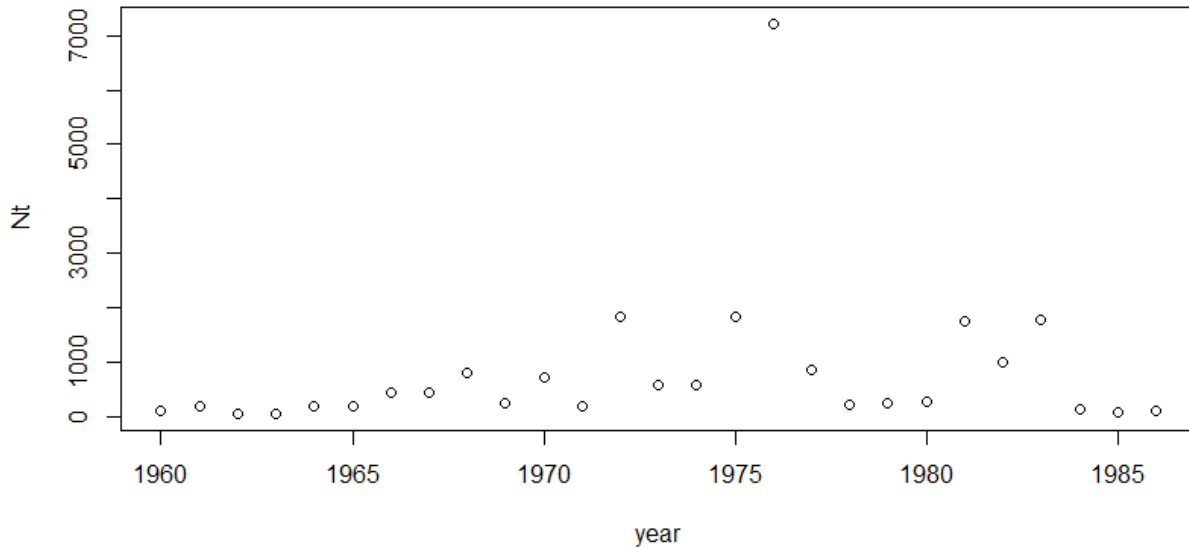
Question 4 continued



R Output for the Practice Final Examination

Question 4A

```
> help(baycheck)
> attach(baycheck)
> names(baycheck)
[1] "year" "Nt"
>
> plot(year, Nt)
```



```
> n <- length(year)
> yt <- log(Nt[-1]/Nt[-n])
> nt <- Nt[-n]
> data.frame(baycheck, "yt"=c(yt, NA), "nt"=c(nt, NA))
```

	year	Nt	yt	nt
1	1960	90	0.66497630	90
2	1961	175	-1.47590652	175
3	1962	40	0.11778304	40
4	1963	45	1.35812348	45
5	1964	175	0.13353139	175
6	1965	200	0.75377180	200
7	1966	425	0.00000000	425
8	1967	425	0.63252256	425
9	1968	800	-1.13943428	800
10	1969	256	1.02430398	256
11	1970	713	-1.28121439	713
12	1971	198	2.21777515	198
13	1972	1819	-1.15167214	1819
14	1973	575	-0.01401074	575
15	1974	567	1.16568287	567
16	1975	1819	1.37953711	1819
17	1976	7227	-2.13799276	7227
18	1977	852	-1.37230812	852
19	1978	216	0.12188982	216
20	1979	244	0.09008043	244
21	1980	267	1.88183523	267
22	1981	1753	-0.56232911	1753
23	1982	999	0.58209818	999
24	1983	1788	-2.52600833	1788
25	1984	143	-0.59339678	143
26	1985	79	0.17384693	79
27	1986	94	NA	NA

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R Output for the Practice Final Examination

Question 4A continued

```
> baycheck.lm <- lm(yt ~ nt)
> summary(baycheck.lm)
```

```
Call:
lm(formula = yt ~ nt)
```

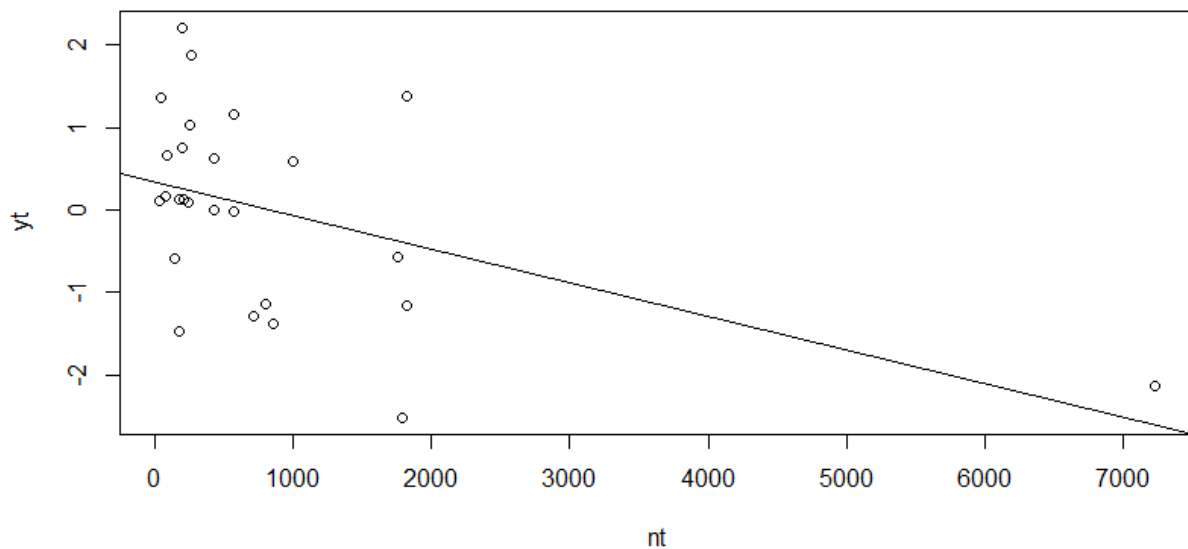
```
Residuals:
    Min       1Q   Median       3Q      Max
-2.1410 -0.6184 -0.1376  0.6059  1.9529
```

```
Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  0.3458097   0.2466196    1.402   0.1737
nt          -0.0004088   0.0001509   -2.708   0.0123 *
```

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 1.078 on 24 degrees of freedom
Multiple R-squared:  0.2341,    Adjusted R-squared:  0.2022
F-statistic: 7.335 on 1 and 24 DF,  p-value: 0.01227
```

```
> plot(nt, yt)
> abline(baycheck.lm)
> # identify(nt, yt, labels=as.character(year[-n]))
```

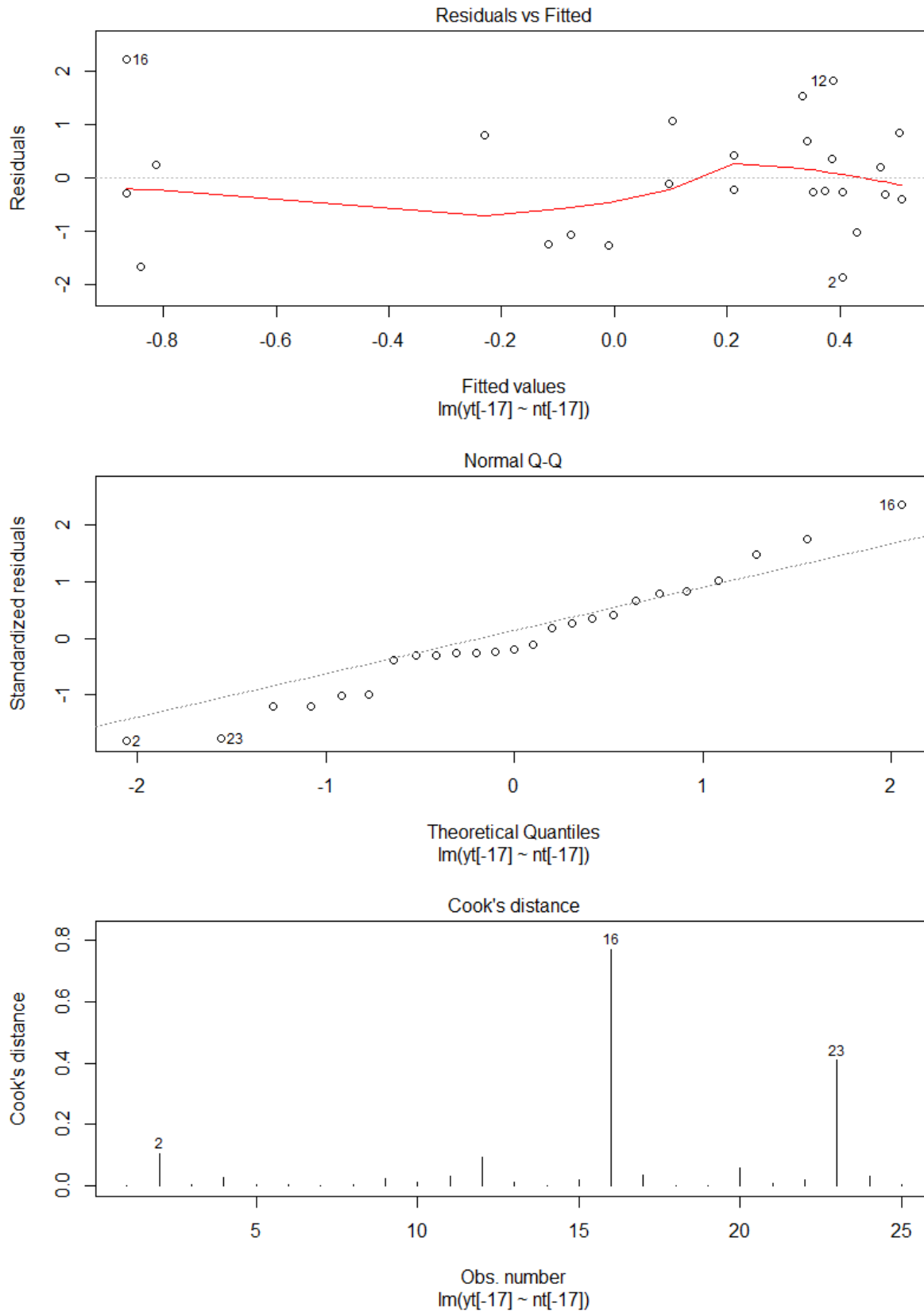


```
> baycheck.lm2 <- lm(yt[-17] ~ nt[-17])
> plot(baycheck.lm2, which=c(1, 2, 4))
```

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R Output for the Practice Final Examination

Question 4A continued



STAT2008/4038/6038 REGRESSION MODELLING

R Output for the Practice Final Examination

Question 4A continued

```
> anova(baycheck.lm2)
```

Analysis of Variance Table

Response: yt[-17]

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
nt[-17]	1	5.1233	5.1233	4.4445	0.04612 *
Residuals	23	26.5130	1.1527		

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```
>
```

```
> summary(baycheck.lm2)
```

Call:

```
lm(formula = yt[-17] ~ nt[-17])
```

Residuals:

Min	1Q	Median	3Q	Max
-1.8809	-0.3914	-0.2120	0.6819	2.2438

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.5400918	0.3037225	1.778	0.0886 .
nt[-17]	-0.0007721	0.0003662	-2.108	0.0461 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.074 on 23 degrees of freedom

Multiple R-squared: 0.1619, Adjusted R-squared: 0.1255

F-statistic: 4.444 on 1 and 23 DF, p-value: 0.04612

```
> mean(nt[-17])
```

```
[1] 586.52
```

```
>
```

```
> var(nt[-17])
```

```
[1] 358119
```

STAT2008/4038/6038 REGRESSION MODELLING

R Output for the Practice Final Examination

Statistical Tables

```
> # Selected quantiles of the F distribution:
> NumeratorDF <- c(1:10)
> DenominatorDF <- c(1: 50, 60, 70, 80, 90, 100)
> Fquantiles0.95 <- matrix(0, ncol=length(NumeratorDF), nrow=length(DenominatorDF))
> for(i in 1:length(NumeratorDF)){for(j in 1:length(DenominatorDF)){
+   Fquantiles0.95[j,i]=round(qf(0.95,i, DenominatorDF[j]), 3)}}
> dimnames(Fquantiles0.95) <- list(DenominatorDF, NumeratorDF)
> Fquantiles0.95
```

	1	2	3	4	5	6	7	8	9	10
1	161.448	199.500	215.707	224.583	230.162	233.986	236.768	238.883	240.543	241.882
2	18.513	19.000	19.164	19.247	19.296	19.330	19.353	19.371	19.385	19.396
3	10.128	9.552	9.277	9.117	9.013	8.941	8.887	8.845	8.812	8.786
4	7.709	6.944	6.591	6.388	6.256	6.163	6.094	6.041	5.999	5.964
5	6.608	5.786	5.409	5.192	5.050	4.950	4.876	4.818	4.772	4.735
6	5.987	5.143	4.757	4.534	4.387	4.284	4.207	4.147	4.099	4.060
7	5.591	4.737	4.347	4.120	3.972	3.866	3.787	3.726	3.677	3.637
8	5.318	4.459	4.066	3.838	3.687	3.581	3.500	3.438	3.388	3.347
9	5.117	4.256	3.863	3.633	3.482	3.374	3.293	3.230	3.179	3.137
10	4.965	4.103	3.708	3.478	3.326	3.217	3.135	3.072	3.020	2.978
11	4.844	3.982	3.587	3.357	3.204	3.095	3.012	2.948	2.896	2.854
12	4.747	3.885	3.490	3.259	3.106	2.996	2.913	2.849	2.796	2.753
13	4.667	3.806	3.411	3.179	3.025	2.915	2.832	2.767	2.714	2.671
14	4.600	3.739	3.344	3.112	2.958	2.848	2.764	2.699	2.646	2.602
15	4.543	3.682	3.287	3.056	2.901	2.790	2.707	2.641	2.588	2.544
16	4.494	3.634	3.239	3.007	2.852	2.741	2.657	2.591	2.538	2.494
17	4.451	3.592	3.197	2.965	2.810	2.699	2.614	2.548	2.494	2.450
18	4.414	3.555	3.160	2.928	2.773	2.661	2.577	2.510	2.456	2.412
19	4.381	3.522	3.127	2.895	2.740	2.628	2.544	2.477	2.423	2.378
20	4.351	3.493	3.098	2.866	2.711	2.599	2.514	2.447	2.393	2.348
21	4.325	3.467	3.072	2.840	2.685	2.573	2.488	2.420	2.366	2.321
22	4.301	3.443	3.049	2.817	2.661	2.549	2.464	2.397	2.342	2.297
23	4.279	3.422	3.028	2.796	2.640	2.528	2.442	2.375	2.320	2.275
24	4.260	3.403	3.009	2.776	2.621	2.508	2.423	2.355	2.300	2.255
25	4.242	3.385	2.991	2.759	2.603	2.490	2.405	2.337	2.282	2.236
26	4.225	3.369	2.975	2.743	2.587	2.474	2.388	2.321	2.265	2.220
27	4.210	3.354	2.960	2.728	2.572	2.459	2.373	2.305	2.250	2.204
28	4.196	3.340	2.947	2.714	2.558	2.445	2.359	2.291	2.236	2.190
29	4.183	3.328	2.934	2.701	2.545	2.432	2.346	2.278	2.223	2.177
30	4.171	3.316	2.922	2.690	2.534	2.421	2.334	2.266	2.211	2.165
31	4.160	3.305	2.911	2.679	2.523	2.409	2.323	2.255	2.199	2.153
32	4.149	3.295	2.901	2.668	2.512	2.399	2.313	2.244	2.189	2.142
33	4.139	3.285	2.892	2.659	2.503	2.389	2.303	2.235	2.179	2.133
34	4.130	3.276	2.883	2.650	2.494	2.380	2.294	2.225	2.170	2.123
35	4.121	3.267	2.874	2.641	2.485	2.372	2.285	2.217	2.161	2.114
36	4.113	3.259	2.866	2.634	2.477	2.364	2.277	2.209	2.153	2.106
37	4.105	3.252	2.859	2.626	2.470	2.356	2.270	2.201	2.145	2.098
38	4.098	3.245	2.852	2.619	2.463	2.349	2.262	2.194	2.138	2.091
39	4.091	3.238	2.845	2.612	2.456	2.342	2.255	2.187	2.131	2.084
40	4.085	3.232	2.839	2.606	2.449	2.336	2.249	2.180	2.124	2.077
41	4.079	3.226	2.833	2.600	2.443	2.330	2.243	2.174	2.118	2.071
42	4.073	3.220	2.827	2.594	2.438	2.324	2.237	2.168	2.112	2.065
43	4.067	3.214	2.822	2.589	2.432	2.318	2.232	2.163	2.106	2.059
44	4.062	3.209	2.816	2.584	2.427	2.313	2.226	2.157	2.101	2.054
45	4.057	3.204	2.812	2.579	2.422	2.308	2.221	2.152	2.096	2.049
46	4.052	3.200	2.807	2.574	2.417	2.304	2.216	2.147	2.091	2.044
47	4.047	3.195	2.802	2.570	2.413	2.299	2.212	2.143	2.086	2.039
48	4.043	3.191	2.798	2.565	2.409	2.295	2.207	2.138	2.082	2.035
49	4.038	3.187	2.794	2.561	2.404	2.290	2.203	2.134	2.077	2.030
50	4.034	3.183	2.790	2.557	2.400	2.286	2.199	2.130	2.073	2.026
60	4.001	3.150	2.758	2.525	2.368	2.254	2.167	2.097	2.040	1.993
70	3.978	3.128	2.736	2.503	2.346	2.231	2.143	2.074	2.017	1.969
80	3.960	3.111	2.719	2.486	2.329	2.214	2.126	2.056	1.999	1.951
90	3.947	3.098	2.706	2.473	2.316	2.201	2.113	2.043	1.986	1.938
100	3.936	3.087	2.696	2.463	2.305	2.191	2.103	2.032	1.975	1.927

```
> # Columns are numerator df, rows are denominator df
>
```

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R Output for the Practice Final Examination

Statistical Tables continued

```
> # Selected quantiles of Student's t distribution:
> DF <- c(1:100, 150, 200, 250, 300, 400, 500, 750, 1000, 10000, 1000000)
> tquantiles0.025 <- round(qt(0.025, DF), 4)
> tquantiles0.05 <- round(qt(0.05, DF), 4)
> tquantiles0.95 <- round(qt(0.95, DF), 4)
> tquantiles0.975 <- round(qt(0.975, DF), 4)
> tquantiles <- rbind(tquantiles0.025, tquantiles0.05, tquantiles0.95, tquantiles0.975)
> dimnames(tquantiles) <- list(c("t 0.025", "t 0.05", "t 0.95", "t 0.975"), DF)
> tquantiles
```

	1	2	3	4	5	6	7	8	9	10
t 0.025	-12.7062	-4.3027	-3.1824	-2.7764	-2.5706	-2.4469	-2.3646	-2.3060	-2.2622	-2.2281
t 0.05	-6.3138	-2.9200	-2.3534	-2.1318	-2.0150	-1.9432	-1.8946	-1.8595	-1.8331	-1.8125
t 0.95	6.3138	2.9200	2.3534	2.1318	2.0150	1.9432	1.8946	1.8595	1.8331	1.8125
t 0.975	12.7062	4.3027	3.1824	2.7764	2.5706	2.4469	2.3646	2.3060	2.2622	2.2281
	11	12	13	14	15	16	17	18	19	20
t 0.025	-2.2010	-2.1788	-2.1604	-2.1448	-2.1314	-2.1199	-2.1098	-2.1009	-2.0930	-2.0860
t 0.05	-1.7959	-1.7823	-1.7709	-1.7613	-1.7531	-1.7459	-1.7396	-1.7341	-1.7291	-1.7247
t 0.95	1.7959	1.7823	1.7709	1.7613	1.7531	1.7459	1.7396	1.7341	1.7291	1.7247
t 0.975	2.2010	2.1788	2.1604	2.1448	2.1314	2.1199	2.1098	2.1009	2.0930	2.0860
	21	22	23	24	25	26	27	28	29	30
t 0.025	-2.0796	-2.0739	-2.0687	-2.0639	-2.0595	-2.0555	-2.0518	-2.0484	-2.0452	-2.0423
t 0.05	-1.7207	-1.7171	-1.7139	-1.7109	-1.7081	-1.7056	-1.7033	-1.7011	-1.6991	-1.6973
t 0.95	1.7207	1.7171	1.7139	1.7109	1.7081	1.7056	1.7033	1.7011	1.6991	1.6973
t 0.975	2.0796	2.0739	2.0687	2.0639	2.0595	2.0555	2.0518	2.0484	2.0452	2.0423
	31	32	33	34	35	36	37	38	39	40
t 0.025	-2.0395	-2.0369	-2.0345	-2.0322	-2.0301	-2.0281	-2.0262	-2.0244	-2.0227	-2.0211
t 0.05	-1.6955	-1.6939	-1.6924	-1.6909	-1.6896	-1.6883	-1.6871	-1.6860	-1.6849	-1.6839
t 0.95	1.6955	1.6939	1.6924	1.6909	1.6896	1.6883	1.6871	1.6860	1.6849	1.6839
t 0.975	2.0395	2.0369	2.0345	2.0322	2.0301	2.0281	2.0262	2.0244	2.0227	2.0211
	41	42	43	44	45	46	47	48	49	50
t 0.025	-2.0195	-2.0181	-2.0167	-2.0154	-2.0141	-2.0129	-2.0117	-2.0106	-2.0096	-2.0086
t 0.05	-1.6829	-1.6820	-1.6811	-1.6802	-1.6794	-1.6787	-1.6779	-1.6772	-1.6766	-1.6759
t 0.95	1.6829	1.6820	1.6811	1.6802	1.6794	1.6787	1.6779	1.6772	1.6766	1.6759
t 0.975	2.0195	2.0181	2.0167	2.0154	2.0141	2.0129	2.0117	2.0106	2.0096	2.0086
	51	52	53	54	55	56	57	58	59	60
t 0.025	-2.0076	-2.0066	-2.0057	-2.0049	-2.0040	-2.0032	-2.0025	-2.0017	-2.0010	-2.0003
t 0.05	-1.6753	-1.6747	-1.6741	-1.6736	-1.6730	-1.6725	-1.6720	-1.6716	-1.6711	-1.6706
t 0.95	1.6753	1.6747	1.6741	1.6736	1.6730	1.6725	1.6720	1.6716	1.6711	1.6706
t 0.975	2.0076	2.0066	2.0057	2.0049	2.0040	2.0032	2.0025	2.0017	2.0010	2.0003
	61	62	63	64	65	66	67	68	69	70
t 0.025	-1.9996	-1.9990	-1.9983	-1.9977	-1.9971	-1.9966	-1.9960	-1.9955	-1.9949	-1.9944
t 0.05	-1.6702	-1.6698	-1.6694	-1.6690	-1.6686	-1.6683	-1.6679	-1.6676	-1.6672	-1.6669
t 0.95	1.6702	1.6698	1.6694	1.6690	1.6686	1.6683	1.6679	1.6676	1.6672	1.6669
t 0.975	1.9996	1.9990	1.9983	1.9977	1.9971	1.9966	1.9960	1.9955	1.9949	1.9944
	71	72	73	74	75	76	77	78	79	80
t 0.025	-1.9939	-1.9935	-1.9930	-1.9925	-1.9921	-1.9917	-1.9913	-1.9908	-1.9905	-1.9901
t 0.05	-1.6666	-1.6663	-1.6660	-1.6657	-1.6654	-1.6652	-1.6649	-1.6646	-1.6644	-1.6641
t 0.95	1.6666	1.6663	1.6660	1.6657	1.6654	1.6652	1.6649	1.6646	1.6644	1.6641
t 0.975	1.9939	1.9935	1.9930	1.9925	1.9921	1.9917	1.9913	1.9908	1.9905	1.9901
	81	82	83	84	85	86	87	88	89	90
t 0.025	-1.9897	-1.9893	-1.9890	-1.9886	-1.9883	-1.9879	-1.9876	-1.9873	-1.9870	-1.9867
t 0.05	-1.6639	-1.6636	-1.6634	-1.6632	-1.6630	-1.6628	-1.6626	-1.6624	-1.6622	-1.6620
t 0.95	1.6639	1.6636	1.6634	1.6632	1.6630	1.6628	1.6626	1.6624	1.6622	1.6620
t 0.975	1.9897	1.9893	1.9890	1.9886	1.9883	1.9879	1.9876	1.9873	1.9870	1.9867
	91	92	93	94	95	96	97	98	99	100
t 0.025	-1.9864	-1.9861	-1.9858	-1.9855	-1.9853	-1.9850	-1.9847	-1.9845	-1.9842	-1.9840
t 0.05	-1.6618	-1.6616	-1.6614	-1.6612	-1.6611	-1.6609	-1.6607	-1.6606	-1.6604	-1.6602
t 0.95	1.6618	1.6616	1.6614	1.6612	1.6611	1.6609	1.6607	1.6606	1.6604	1.6602
t 0.975	1.9864	1.9861	1.9858	1.9855	1.9853	1.9850	1.9847	1.9845	1.9842	1.9840
	150	200	250	300	400	500	750	1000	10000	1e+06
t 0.025	-1.9759	-1.9719	-1.9695	-1.9679	-1.9659	-1.9647	-1.9631	-1.9623	-1.9602	-1.9600
t 0.05	-1.6551	-1.6525	-1.6510	-1.6499	-1.6487	-1.6479	-1.6469	-1.6464	-1.6450	-1.6449
t 0.95	1.6551	1.6525	1.6510	1.6499	1.6487	1.6479	1.6469	1.6464	1.6450	1.6449
t 0.975	1.9759	1.9719	1.9695	1.9679	1.9659	1.9647	1.9631	1.9623	1.9602	1.9600

>

(End of R Output)