Statistical Methods - Assignment 3

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Theoretical exercises

4.1

```
// todo
```

4.2

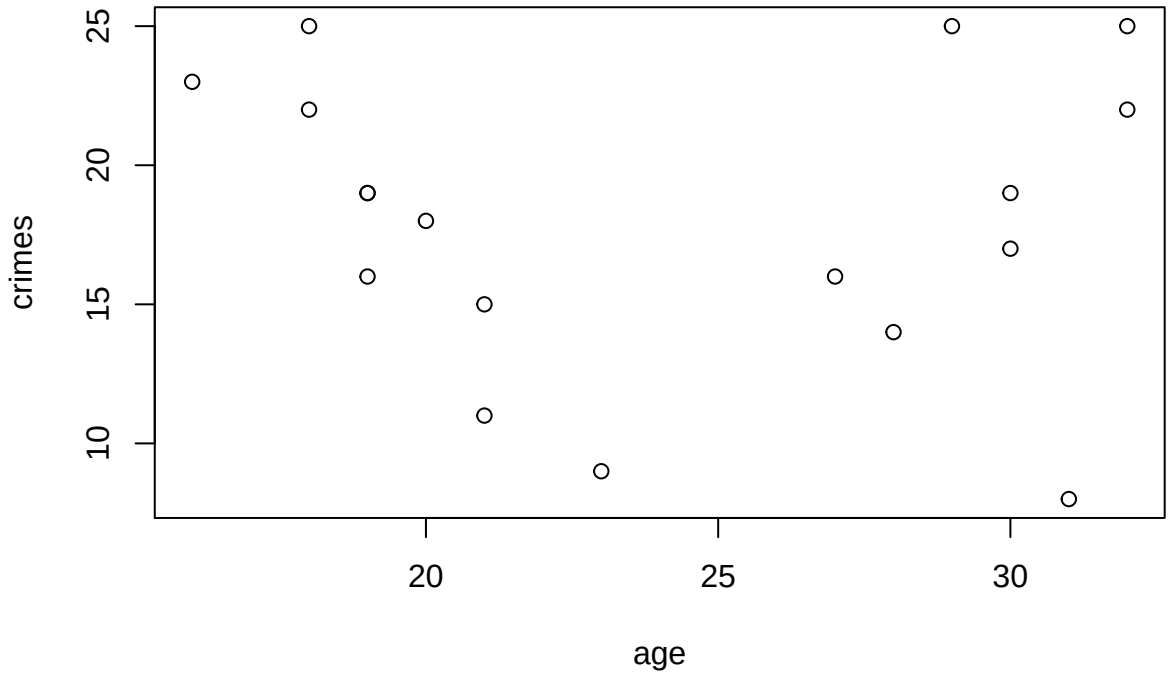
```
// todo
```

R-Exercises

4.3

a)

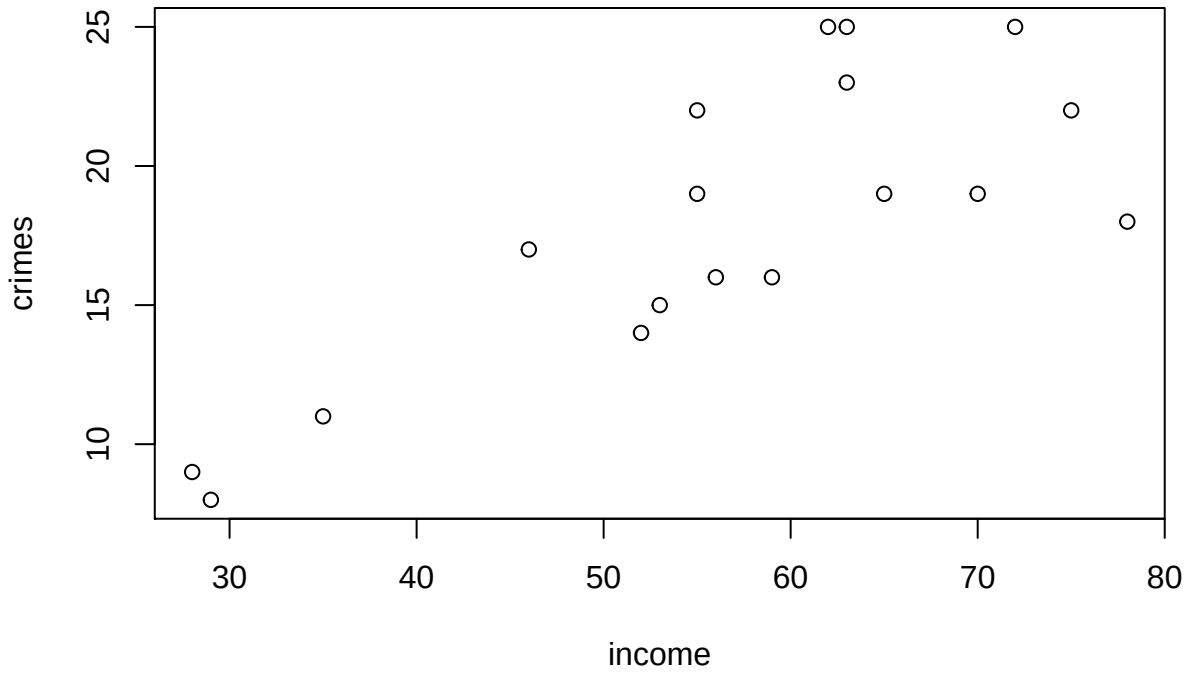
```
##  [1] 16 18 18 19 19 19 20 21 21 23 27 28 29 30 30 31 32 32
##  [1] 23 25 22 16 19 19 18 11 15  9 16 14 25 17 19  8 22 25
```




```
## [1] "Correlation: ( age , crimes ) -0.0709530096415513"
## [1] "Linear correlation seems unlikely"
```

b)

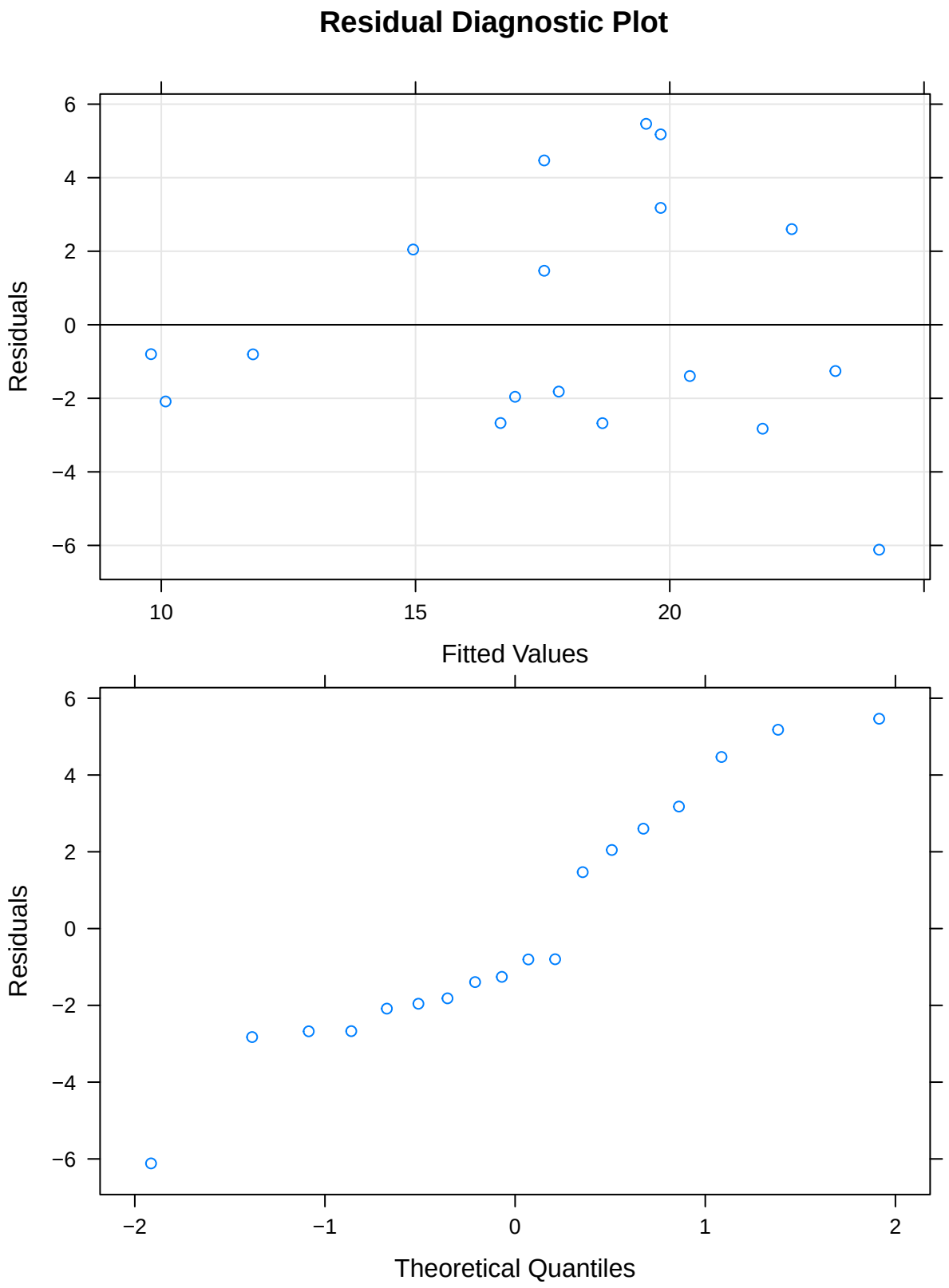
```
##  [1] 63 72 75 59 65 70 78 35 53 28 56 52 63 46 55 29 55 62
##  [1] 23 25 22 16 19 19 18 11 15  9 16 14 25 17 19  8 22 25
```




```
## [1] "Correlation: ( income , crimes ) 0.791557270082001"
## [1] "Linear correlation seems plausible"
```

c)

```
// todo figure how to interpret this output and the plots
// based on https://www.r-bloggers.com/simple-linear-regression-2/
##
## Call:
## lm(formula = crimes ~ income)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -6.117 -2.054 -1.031  2.462  5.465
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.78111    3.21597   0.554    0.587
## income       0.28636    0.05527   5.181  9.1e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.315 on 16 degrees of freedom
## Multiple R-squared:  0.6266, Adjusted R-squared:  0.6032
## F-statistic: 26.85 on 1 and 16 DF,  p-value: 9.097e-05
```


Residual Diagnostic Plot
Residuals
Fitted Values
Residuals
Theoretical Quantiles

d)

e)

4.4

a)

b)

4.5

a)

b)

c)

Appendix

4.3.a

```
dat=matrix(as.numeric(as.matrix(read.table("crimemale.txt")))[2:19,]),ncol=3)
age=dat[,1]
income=dat[,2]
crimes=dat[,3]

investigate_linear_correlation <- function(v1,v2,xlab,ylab){
  print(v1)
  print(v2)
  plot(v1,v2,xlab=xlab,ylab=ylab)
  corr=cor(v1,v2)
  print(paste("Correlation: (",xlab,",",ylab,")",corr))
  corr=abs(corr)

  # TODO adjust these thresholds based on statistical standards (if they exist)

  if (corr<0.7) w ="unlikely"
  else if (corr<0.8) w = "plausible"
  else w="likely"
  print(paste("Linear correlation seems",w))
}

investigate_linear_correlation(age,crimes,"age","crimes")
```

4.3.b

```
investigate_linear_correlation(income,crimes,"income","crimes")
```

4.3.c

```
lmres = lm(crimes ~ income)
summary(lmres)
library("lattice")
xyplot(resid(lmres) ~ fitted(lmres),
  xlab = "Fitted Values",
  ylab = "Residuals",
  main = "Residual Diagnostic Plot",
  panel = function(x, y, ...)
  {
    panel.grid(h = -1, v = -1)
    panel.abline(h = 0)
    panel.xyplot(x, y, ...)
  }
)
qqmath( ~ resid(lmres),
  xlab = "Theoretical Quantiles",
  ylab = "Residuals"
)
```

4.3.d

4.3.e

4.4.a

4.4.b

4.5.a

4.5.b

4.5.c