UNIVERSITY OF NEW SOUTH WALES
DEPARTMENT OF STATISTICS

MATH5856 Introduction to Statistics and Statistical Computations
Tutorial Problems week 13 solutions

1.
```
>Flicker.df<-read.table("flicker.txt", header=T)
> plot.design(Flicker.df)
> plot.design(Flicker.df,fun=median)
> plot.(Flicker.df)
> Flicker.aov<-aov(Flicker ~ Colour, data=Flicker.df)
> summary(Flicker.aov)
             Df Sum of Sq  Mean Sq  F Value      Pr(F)
EyeColour  2  22.99729 11.49864 4.802346 0.02324895
Residuals 16  38.31008  2.39438
> # From the F-test in the ANOVA table, with
> # a 5% level of significance it seems there
> # are significant differences between at
> # least some of the eye colour groups.
```

2.
```
> speed<-c(700,850,820,640,920,480,460,500,570,580,
+ 500,550,480,600,610,900,880,899,780,899,590,540,
+ 560,570,555,520,660,525,610,645)
> gender<-factor(rep(c("Male","Female"),times=c(15,15)))
> group<-factor(rep(c("X","Y","Z","X","Y","Z"),each=5))
> reading.df<-data.frame(speed=speed,gender=gender,group=group)
> plot.design(reading.df)
> par(mfrow=c(1,2))
> plot.factor(reading.df)
> par(mfrow=c(1,1))
> interaction.plot(group,gender,speed)
> # From the plot there doesn't seem to be
> # evidence of an interaction between the
> # two factors.  Lines for different
> # gender groups are roughly parallel
> reading.aov<-aov(speed ~ group*gender, data=reading.df)
> summary(reading.aov)
```

```
              Df Sum of Sq  Mean Sq  F Value     Pr(F)
       group  2  503215.3 251607.6 56.61568 0.0000000
      gender  1   25404.3  25404.3  5.71637 0.0250031
group:gender  2    2816.6   1408.3  0.31689 0.7314124
   Residuals 24  106659.2   4444.1
> # The interaction term is not significant.  Fit the
> # model with no interaction:
> reading.aov<-aov(speed ~ group+gender, data=reading.df)
> summary(reading.aov)
          Df Sum of Sq  Mean Sq  F Value      Pr(F)
    group  2  503215.3 251607.6 59.75566 0.00000000
   gender  1   25404.3  25404.3  6.03340 0.02103074
Residuals 26  109475.8   4210.6
> # It seems that both factors are helpful for
> # explaining variation in the response.
```

3.
```
> ethanol<-read.table("ethanol.dat", header=T)
> attach(ethanol)
> ethanol.lm<-lm(NOx ~ E+C, data=ethanol)
> summary(ethanol.lm)
> par(mfrow=c(2,3))
> plot(ethanol.lm)
> # In the summary output the F statistic and
> # corresponding p-value (0.626) indicate
> # the predictors are not helpful for explaining
> # variation in the response in the linear model.
> # However, the diagnostics indicate that the
> # mean structure is not correctly specified.
```