# Assignment 1

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# Question 1

## (a) Essential assumption check
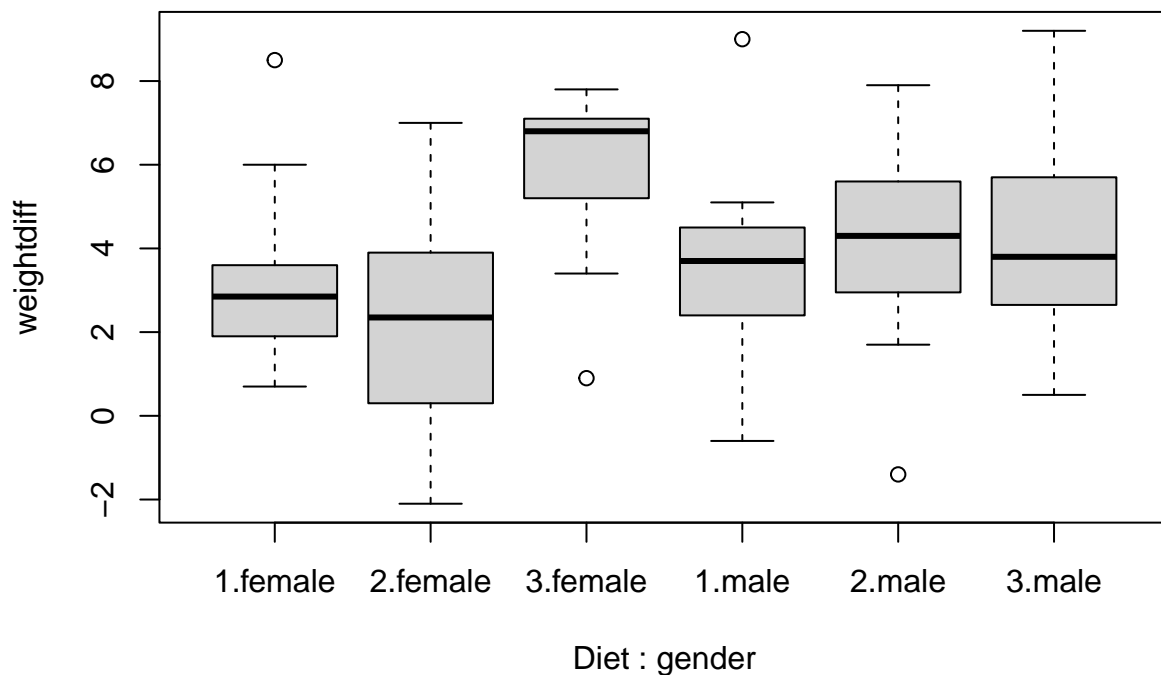
### (i) Normality Distribution

**SW test:**

```
    Shapiro-Wilk normality test

data:  weightdiff
W = 0.98991, p-value = 0.802
```

We want to see non-significant result.

P-value for weight difference test of SW is more than 0.05. H0 is not rejected and we conclude that the assumption f normality is satisfied.

**Normality plot:**



- weightdiff shows the difference between before and after six weeks.

- The formula is `weightdiff = (weight before diet) - (weight 6 weeks after)`

**Outliers check:**  4 outliers are identified via this plot.

There are 1 (Diet1, Male), 1 (Diet1, Female), 1 (Diet2, Male), and 1 (Diet3, Female) observations should be omitted.

Therefore, 4 observations will be deleted as outliers.

**(ii) Homogeneity of Variance**

**Levenne's test**

```
Levene's Test for Homogeneity of Variance (center = median)
      Df F value Pr(>F)
group  5  1.5479 0.1867
      68
```
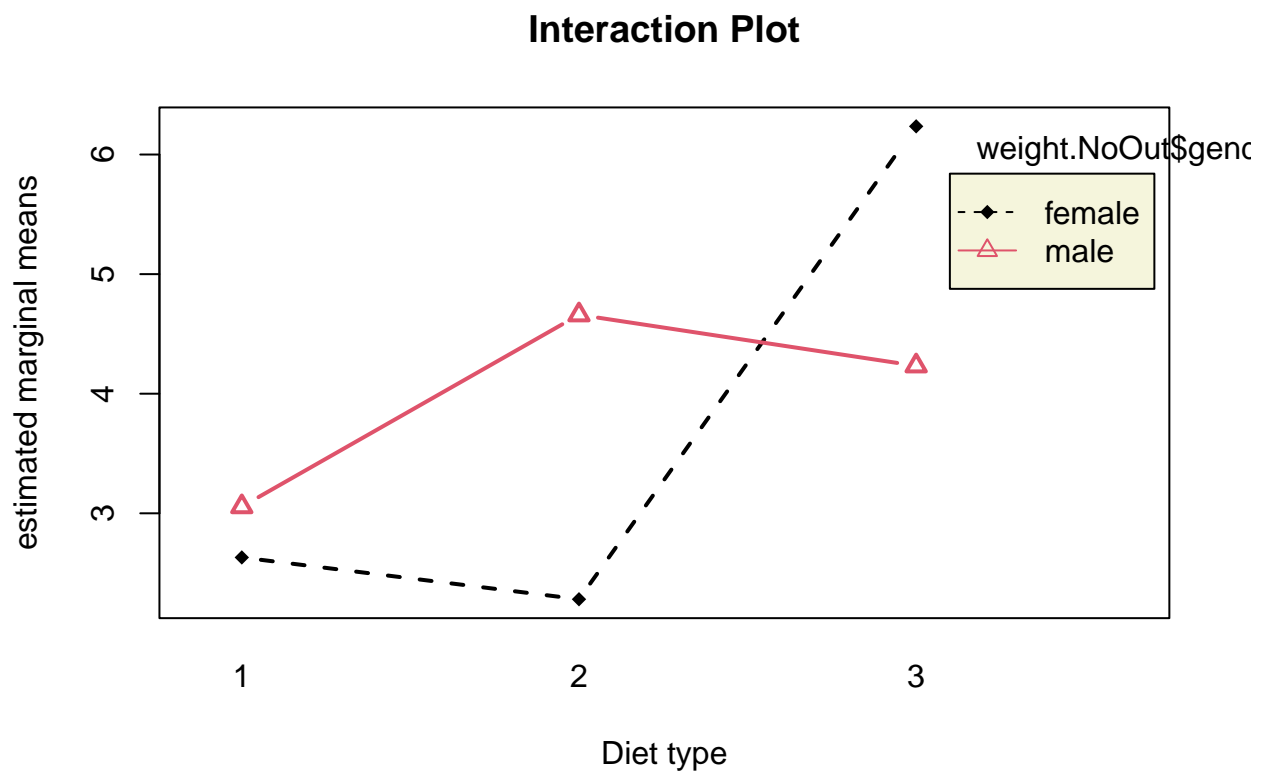
The p-value is more than 0.05 (level of significance), which means the result is non-significant.

Therefore, Homogeneity is met.

**(iii) Independence**

????

**(b) Interaction Plot**

## Interaction Plot

**(c)**

**ANOVA summary:??**

```
            Df Sum Sq Mean Sq F value   Pr(>F)
gender       1   2.27    2.27   0.582 0.448008
Diet         2  89.25   44.63  11.474 5.09e-05 ***
gender:Diet  2  60.81   30.41   7.818 0.000879 ***
Residuals   68 264.48    3.89
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

**Tukey test:**

```
  Tukey multiple comparisons of means
    95% family-wise confidence level

Fit: aov(formula = weightdiff.NoOut ~ gender * Diet, data = weight.NoOut)

$gender
                  diff        lwr      upr     p adj
male-female 0.3546137 -0.5726118 1.281839 0.4480081

$Diet
         diff        lwr      upr     p adj
2-1 0.4002877 -0.9685892 1.769165 0.7639065
3-1 2.4883944  1.1195175 3.857271 0.0001344
3-2 2.0881066  0.7775068 3.398707 0.0008487

$`gender:Diet`
                         diff         lwr       upr     p adj
male:1-female:1     0.4247863 -2.08306614 2.9326388 0.9961356
female:2-female:1  -0.3495192 -2.50900778 1.8099693 0.9968828
male:2-female:1     2.0292308 -0.40339788 4.4618594 0.1552935
female:3-female:1   3.6049451  1.37738325 5.8325069 0.0001568
male:3-female:1     1.6025641 -0.71265064 3.9177788 0.3366516
female:2-male:1    -0.7743056 -3.18405746 1.6354464 0.9339493
male:2-male:1       1.6044444 -1.05284658 4.2617355 0.4912294
female:3-male:1     3.1801587  0.70921862 5.6510988 0.0044074
male:3-male:1       1.1777778 -1.37246393 3.7280195 0.7536003
male:2-female:2     2.3787500  0.04738508 4.7101149 0.0428650
female:3-female:2   3.9544643  1.83795493 6.0709736 0.0000098
male:3-female:2     1.9520833 -0.25649077 4.1606574 0.1132848
female:3-male:2     1.5757143 -0.81884270 3.9702713 0.3934275
male:3-male:2      -0.4266667 -2.90297256 2.0496392 0.9958122
male:3-female:3    -2.0023810 -4.27756015 0.2727982 0.1161146
```

**(d)**

As you can see form the interaction plot, Female Diet 3 has the largest impact on weight difference. It is regarding both gender and diet type.

As can bee seen the difference between before and after six weeks, the larger difference of weight for Male Diet 1 and 2 while it has larger impact on weight difference for Female Diet 3.

# Question 2

## (a)Outliers & Homogeneity

**Outliers**

**Homogeneity**

## (b) Effects of stat packages

## (c) Independent Group