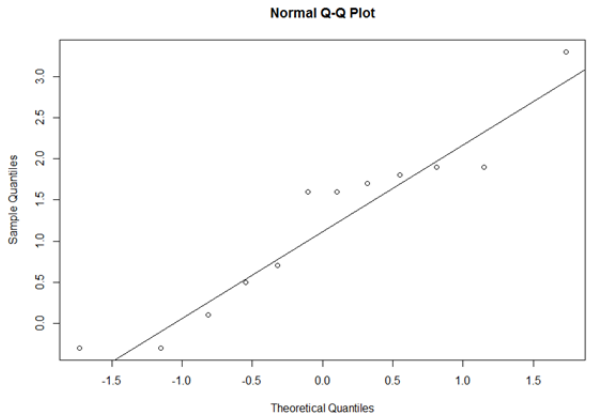
ST511 HW#5

Shaikh Shawon Arefin Shimon 830201247

1. a) Although there are some deviations present in the distribution of data, most data points fall near the normal line in QQplot. Hence, **it can be assumed that the data is normally distributed.**



b) Hypothesis:

$H_0 : \mu_D \leq 0$; where $\mu_D = \mu_{After} - \mu_{Before}$

$H_A : \mu_D > 0$

Test statistic, t = 3.885, df = 11, p-value = 0.001271
As p-value < α=0.05, null hypothesis can be rejected with 95% confidence. So, we can say with 95% confidence that ozone exposure increases lung capacity.

c) 95% confidence interval for the increase in lung capacity = (0.5237735, 1.8928932)
d) For $H_0 : \mu_D \leq 0$; where $\mu_D = \mu_{After} - \mu_{Before}$

$H_A : \mu_D > 0$

p-value = 0.002441 < 0.05
As p-value < α=0.05, null hypothesis can be rejected with 95% confidence. So, we can say with 95% confidence that ozone exposure increases lung capacity.

skshimon@cs.colostate.edu

ST511 HW#5
Shaikh Shawon Arefin Shimon 830201247

R Code:

```
> #Ans 1
> rats<-read.csv(file.choose())
> rats
   X.Rat. X.Before. X.After.
1       1      8.7     9.4
2       2      7.9     9.8
3       3      8.3     9.9
4       4      8.4    10.3
5       5      9.2     8.9
6       6      9.1     8.8
7       7      8.2     9.8
8       8      8.1     8.2
9       9      8.9     9.4
10     10      8.2     9.9
11     11      8.9    12.2
12     12      7.5     9.3
> Diff_After_Before <-rats$X.After.-rats$X.Before.
> Diff_After_Before
 [1]  0.7  1.9  1.6  1.9 -0.3 -0.3  1.6  0.1  0.5  1.7  3.3  1.8
> mean(Diff_After_Before)
[1] 1.208333
> sd(Diff_After_Before)
[1] 1.07742
>
>
> #A
> #Are the difference normally distributed?
> hist(Diff_After_Before)
> qqnorm(Diff_After_Before)
> qqline(Diff_After_Before)
> #NO, most data points are deviated from the straight line in the QQPlot
>
> #B
> t.test(Diff_After_Before,mu=0,alternative = "greater")

        One Sample t-test

data:  Diff_After_Before
t = 3.885, df = 11, p-value = 0.001271
alternative hypothesis: true mean is greater than 0
95 percent confidence interval:
 0.6497695       Inf
sample estimates:
mean of x
```

skshimon@cs.colostate.edu

```
 1.208333

> #No, p value less than alpha
>
> #C Two sided CI
> t.test(Diff_After_Before,mu=0,alternative = "two.sided")

        One Sample t-test

data:  Diff_After_Before
t = 3.885, df = 11, p-value = 0.002541
alternative hypothesis: true mean is not equal to 0
95 percent confidence interval:
 0.5237735 1.8928932
sample estimates:
mean of x
 1.208333

>
>
> #D. Wilcoxon Paired test
> library(coin)
> wilcoxsign_test(X.After. ~ X.Before. , data = rats, distribution="exact", alternative = "gre
ater")

        Exact Wilcoxon-Pratt Signed-Rank Test

data:  y by
        x (pos, neg)
        stratified by block
Z = 2.6692, p-value = 0.002441
alternative hypothesis: true mu is greater than 0

> #P value less than alpha

>
```