# Assignment 3

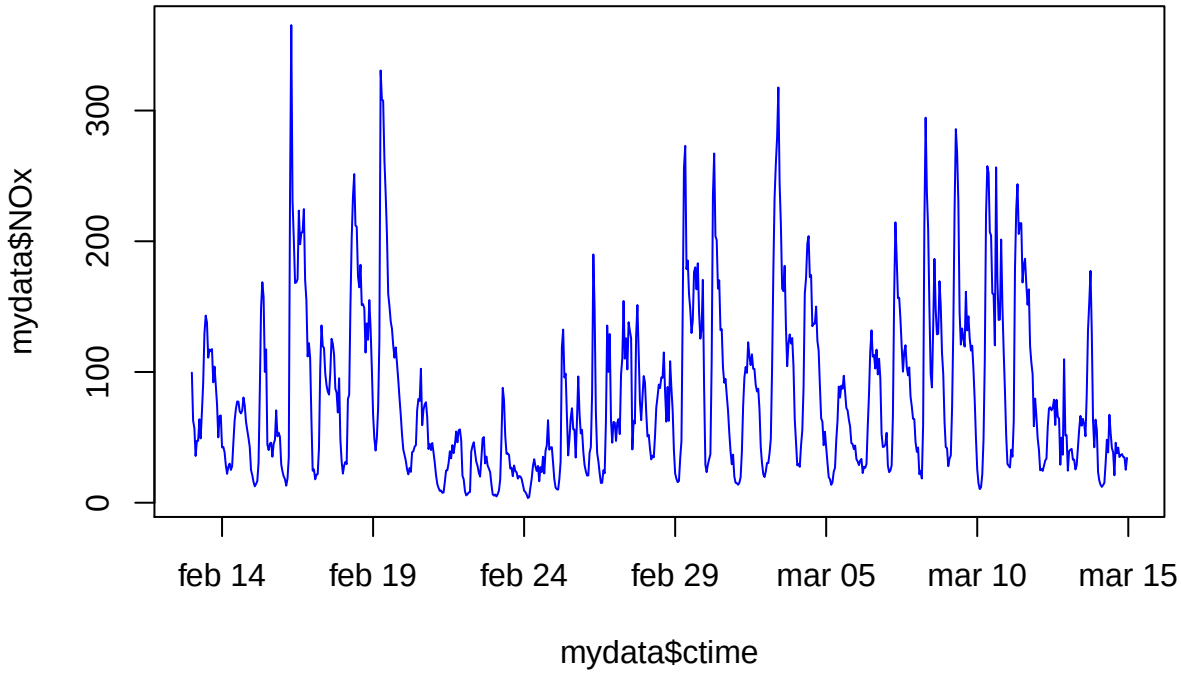
*Arturo Arranz Mateo*

*March 30, 2016*

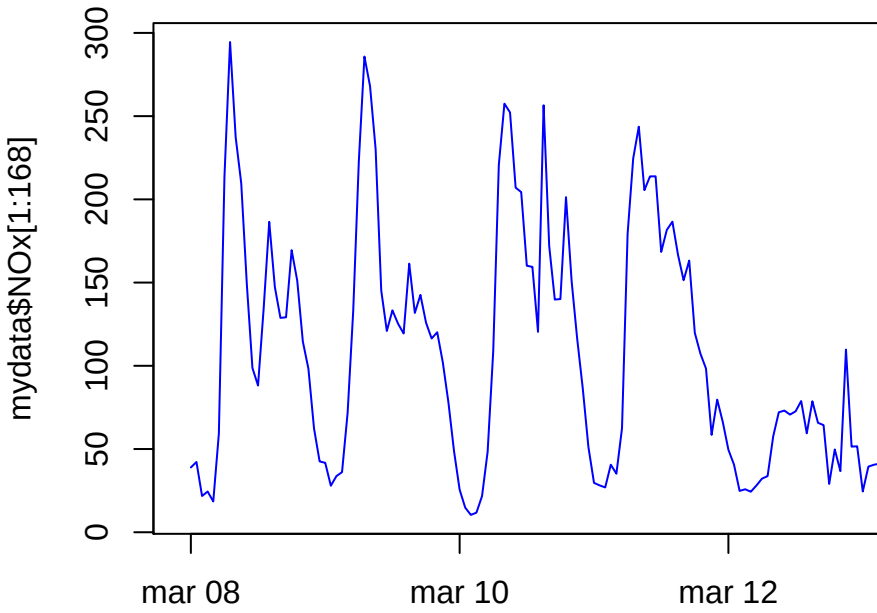
## Question1

You can also embed plots, for example:

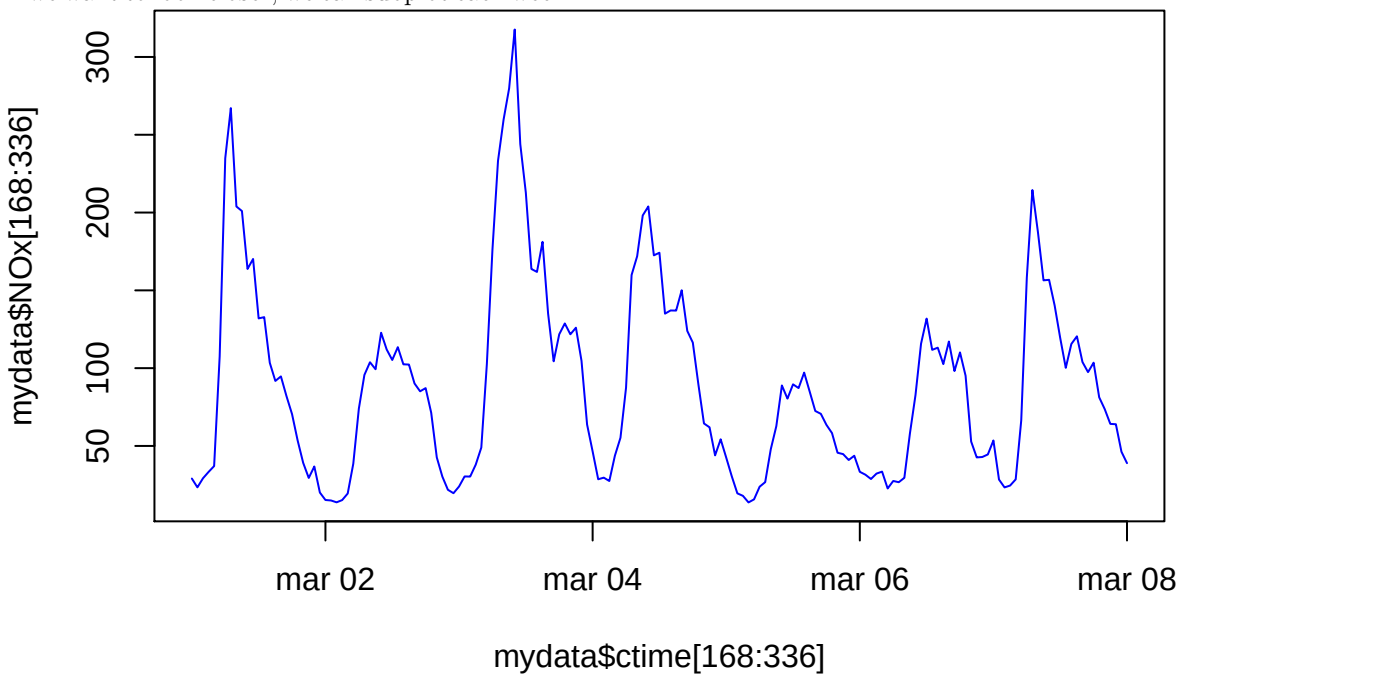
```
## 'data.frame':    744 obs. of  3 variables:
##  $ Date: Factor w/ 31 levels "01-03","02-03",..: 16 16 16 16 16 16 16 16 16 16 ...
##  $ Time: Factor w/ 24 levels "  0- 1"," 10-11",..: 17 15 14 13 12 11 10 9 8 7 ...
##  $ NOx : num  34.2 25.2 34.7 35 37.2 ...
```

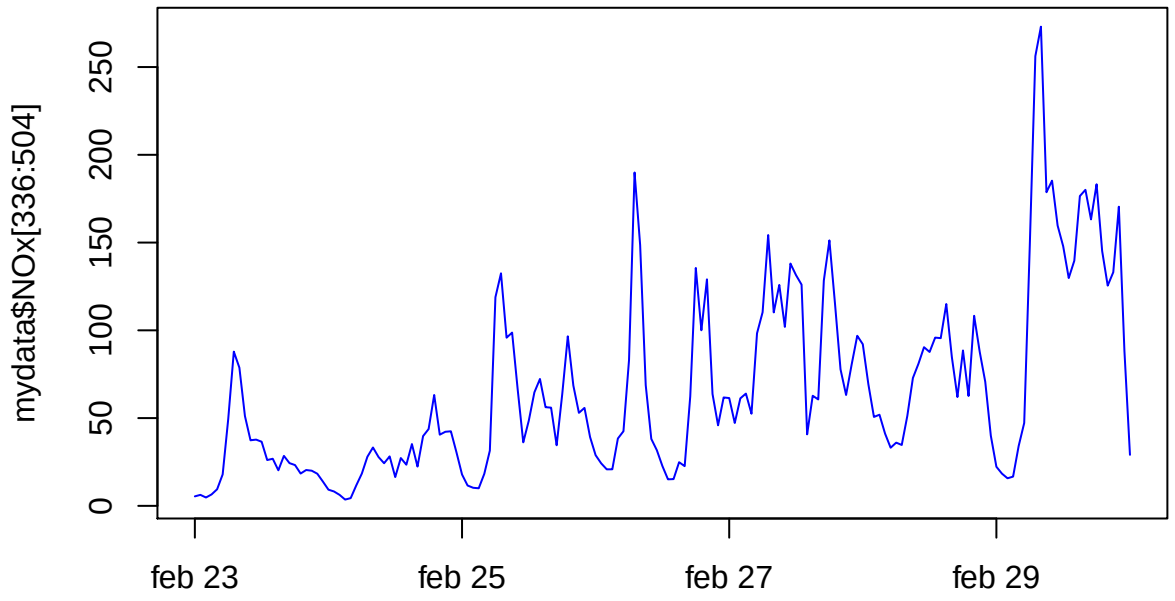


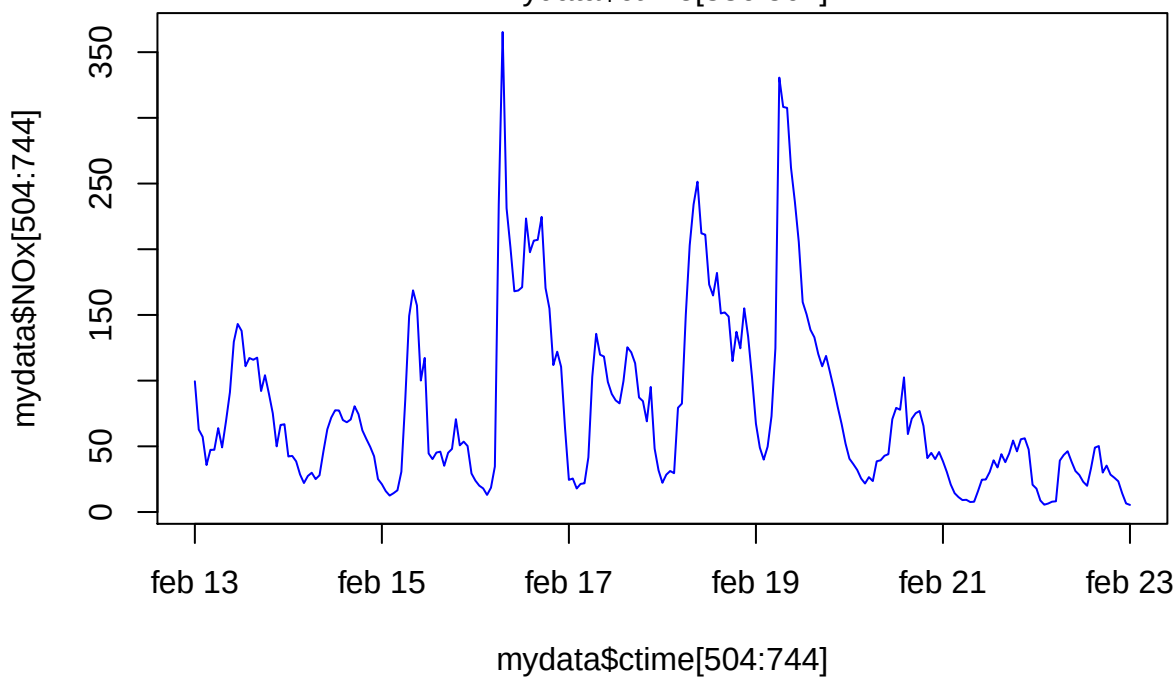

From the raw data plotting we can infer the following observations: - There is not a general trend - Looks like there is a 24 hours seasonality



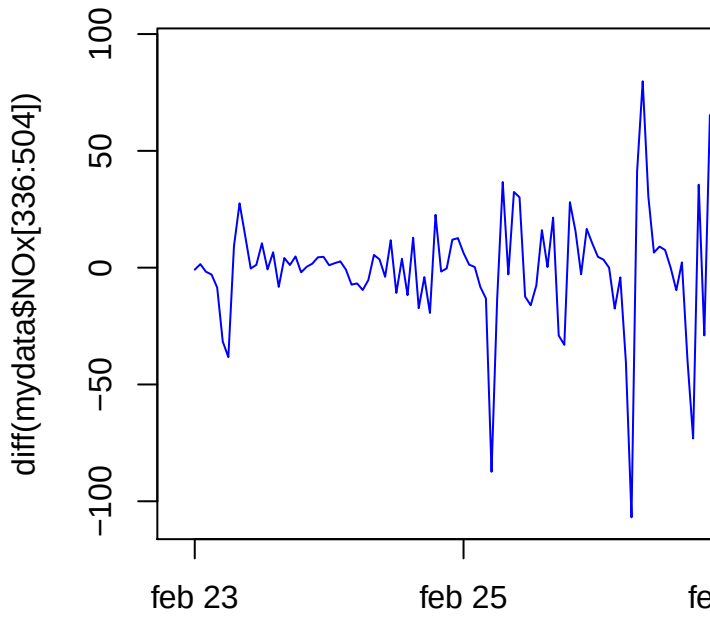

If we want to look closer, we can subplot each week



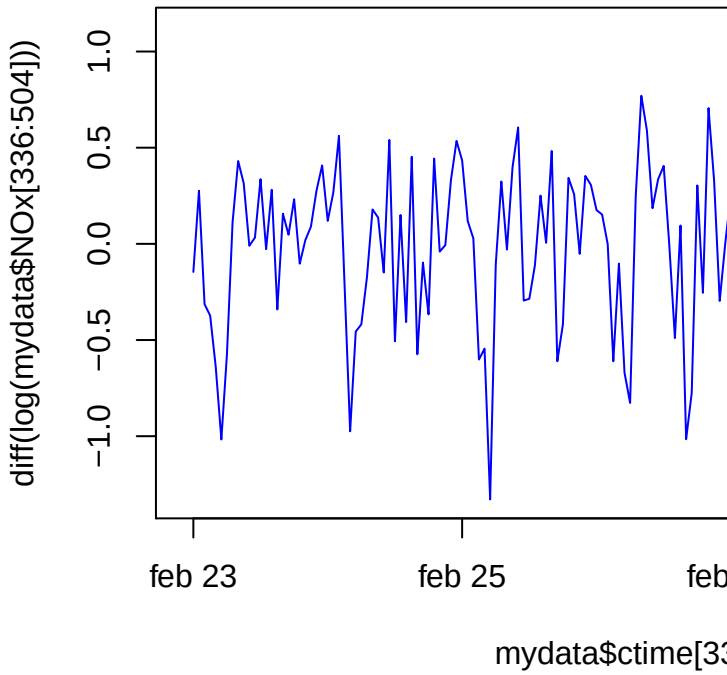


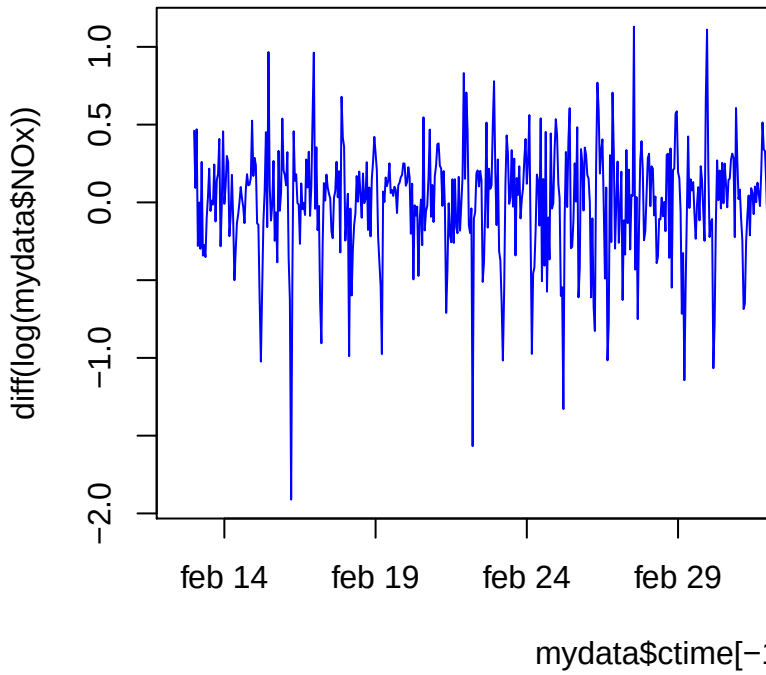

Here the seasonality and day-trend is more obvious. However, we can see that the 3th week data is far from stationary.




We can applay some transformations, like one time differentation:
Now we can see that the mean is constant, and we have remove the trend. However, the variance do not seem constant throught all the data.

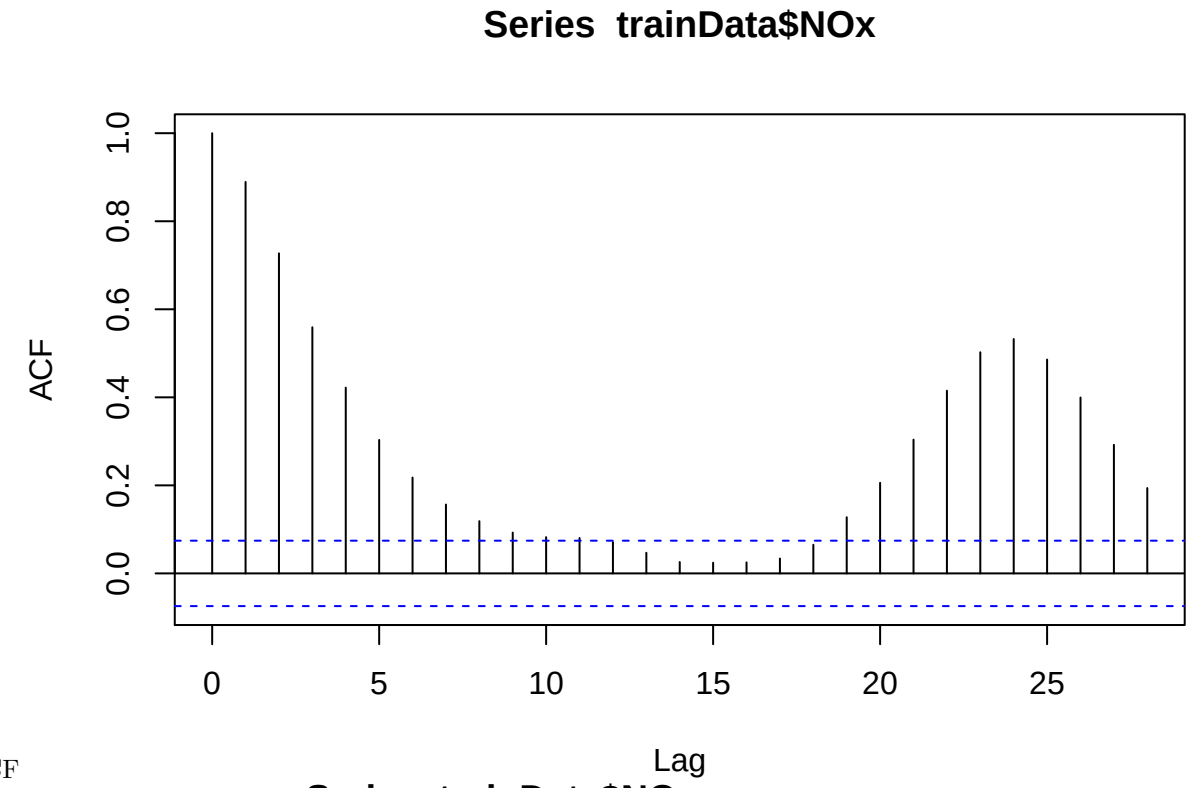



We can applay a logarithmic transformation before differencing.
Now the data seems much more stationary. However we still can clearly see a strong correlation between consecutive samples. For filtering that correaltion we will use the ARMA model.

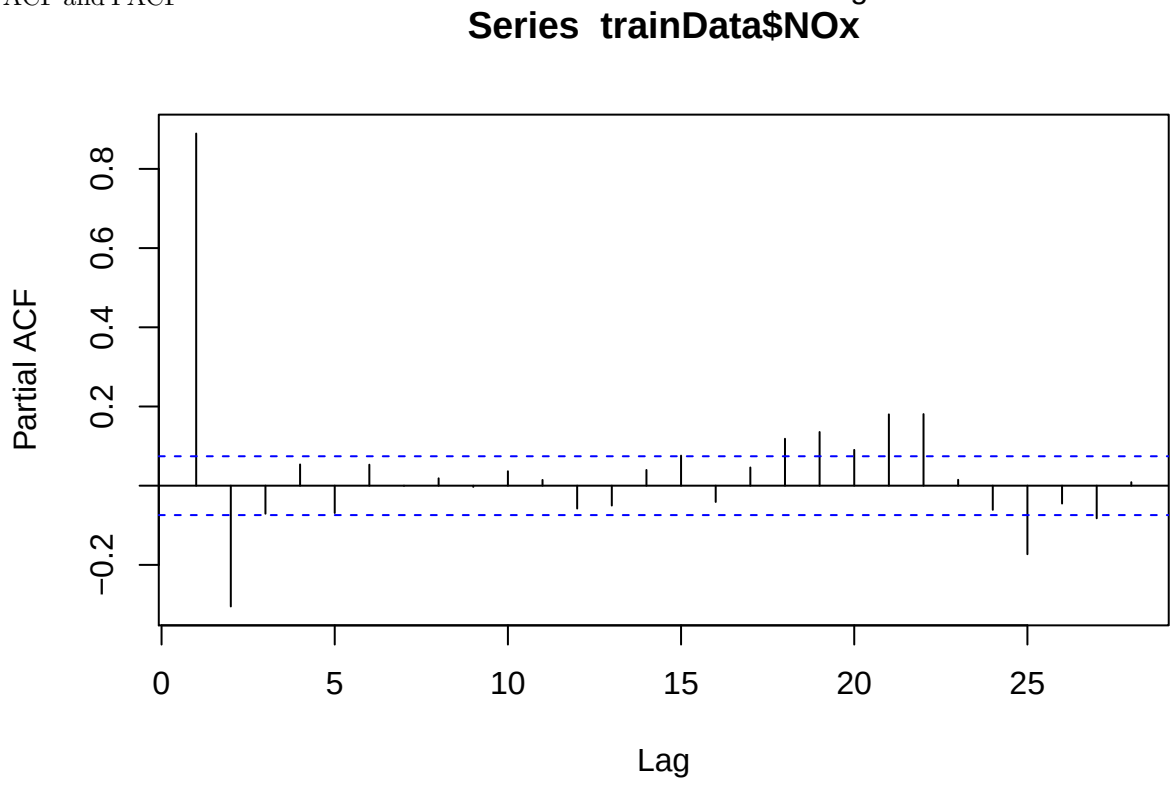


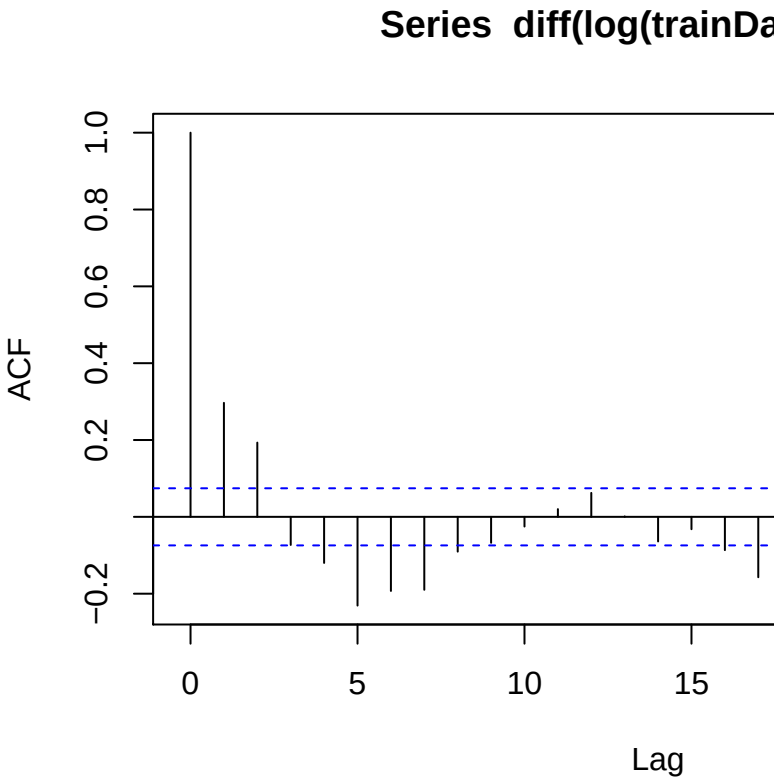

Here is how the whole data looks after both transformations:

**Question2**




ACF and PACF






ACF and PACF with log and differentation transformations