

# chapter1

Loading libraries

```
library(astsa)
library(xts)
```

```
## Loading required package: zoo
```

```
##
```

```
## Attaching package: 'zoo'
```

```
## The following objects are masked from 'package:base':
```

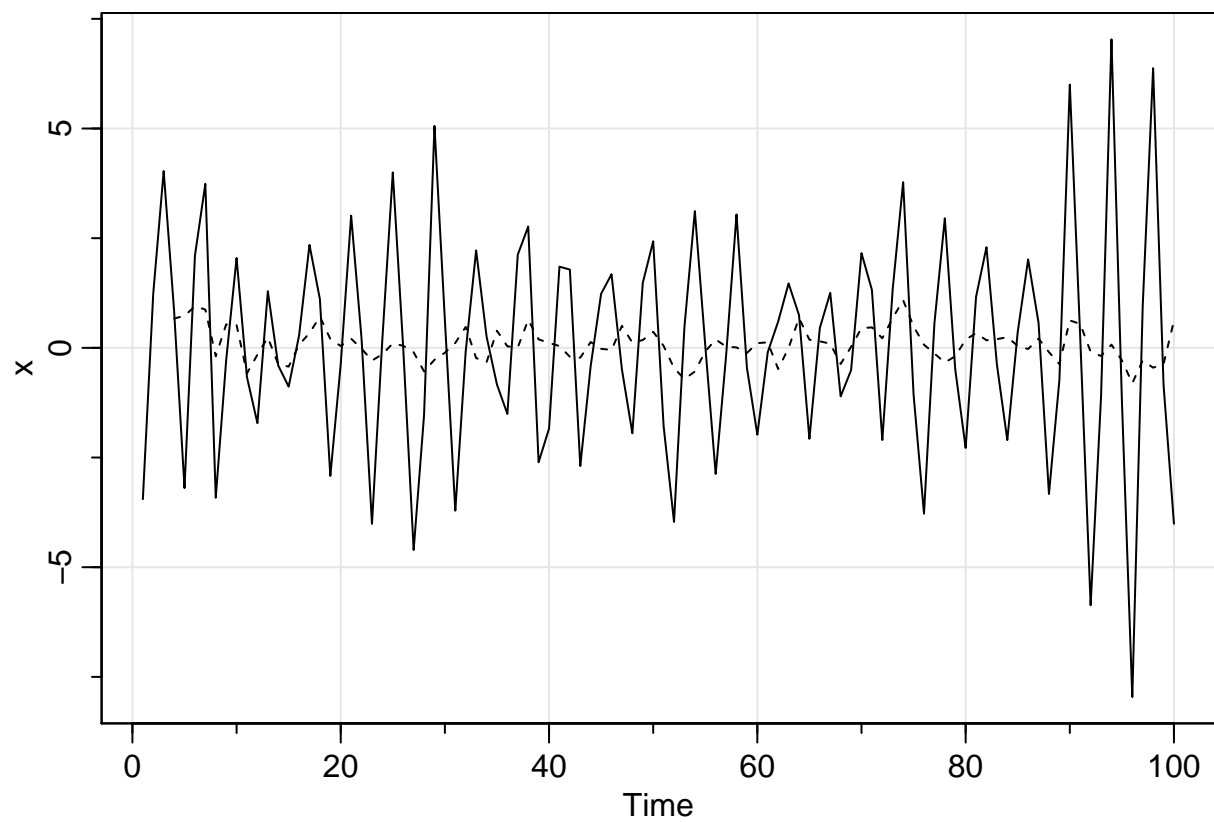
```
##
```

```
##      as.Date, as.Date.numeric
```

## Problems 1.1

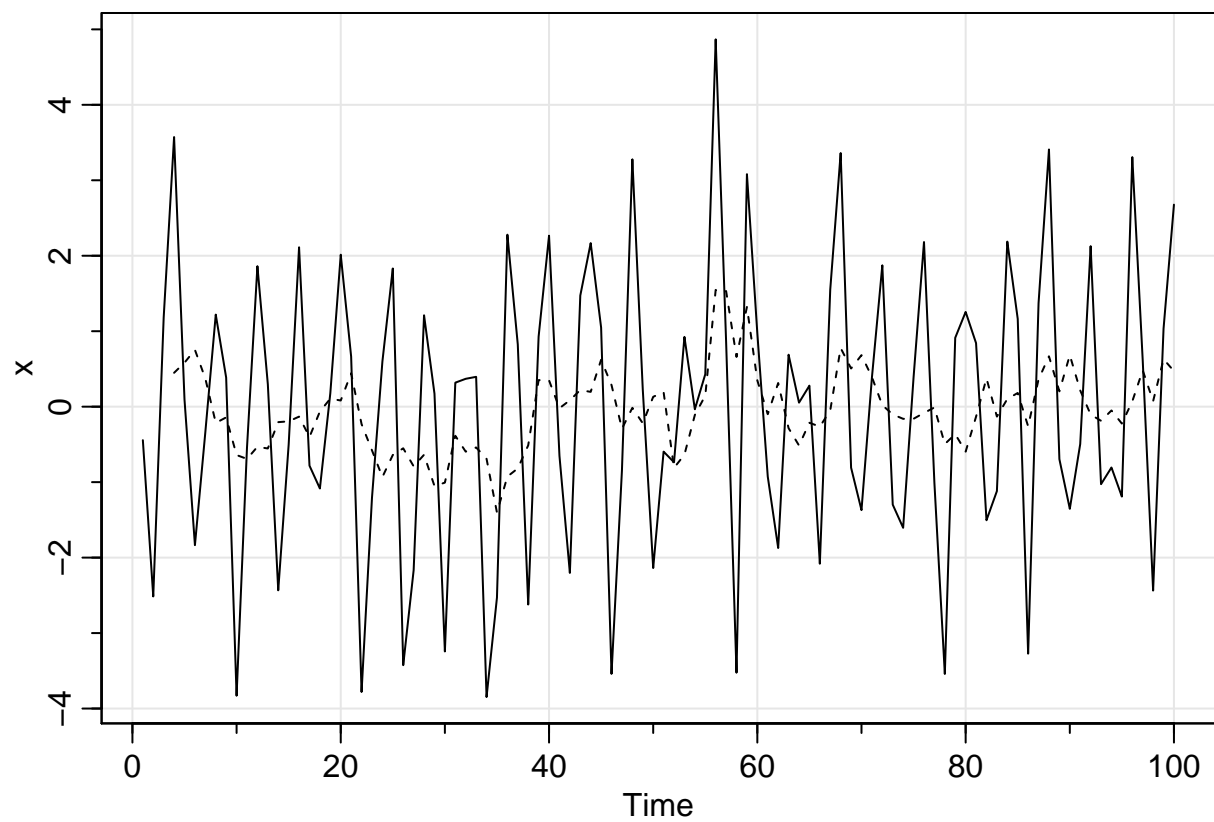
Part a)

```
set.seed(90210)
w = rnorm(150)
x = filter(w, filter=c(0,-0.9),method="recursive")[-(1:50)]
v = filter(x,sides = 1,filter = rep(1/4,4))
tsplot(x)
lines(v,type = 'l',lty = 2)
```



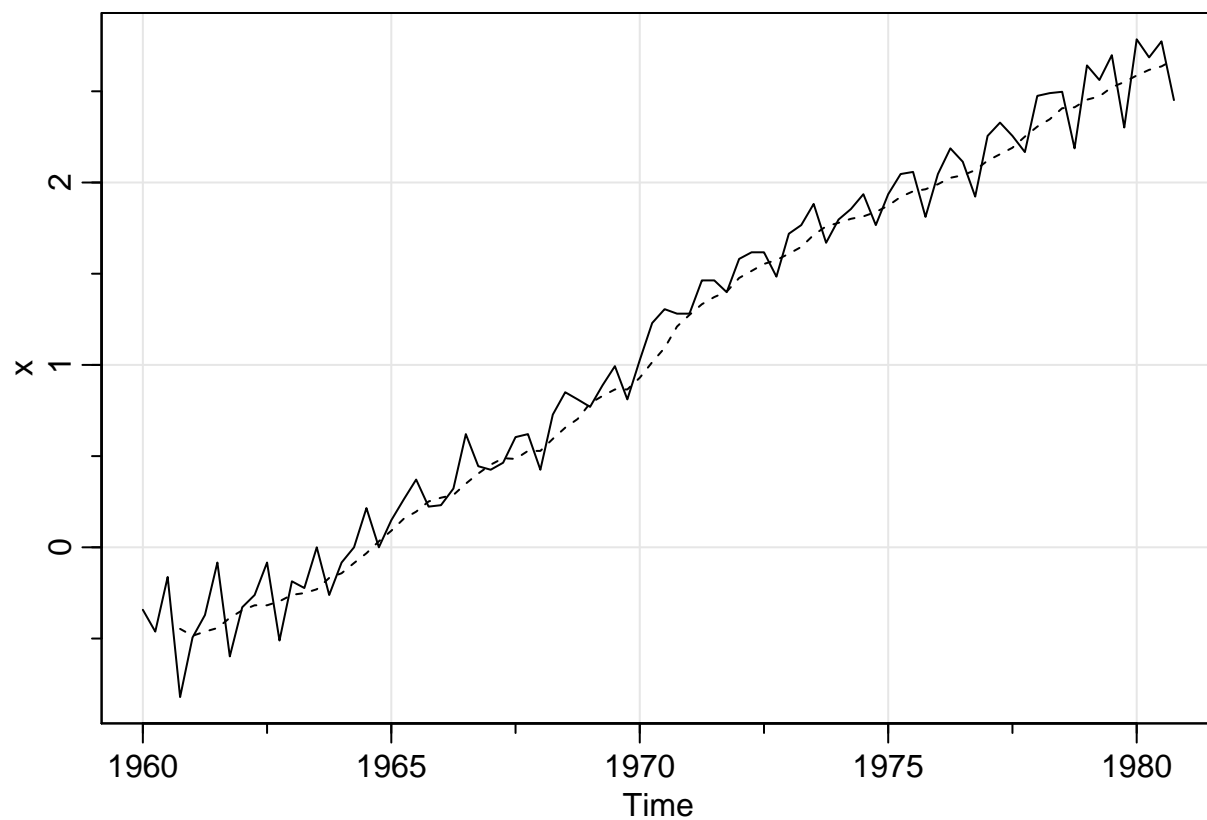
Part b)

```
set.seed(90210)
t = 1:100
cs = 2*cos((2*pi*t)/4)
w = rnorm(100)
x = cs + w
v = filter(x,sides = 1,filter = rep(1/4,4))
tsplot(x)
lines(v,type = 'l',lty = 2)
```



Part c)

```
x = log(jj)
v = filter(x,sides = 1,filter = rep(1/4,4))
tsplot(x)
lines(v,type = 'l',lty = 2)
```



#### Part d)

What is seasonal adjustment?

Seasonal adjustment is a statistical technique that attempts to measure and remove the influences of predictable seasonal patterns.

#### Part e)

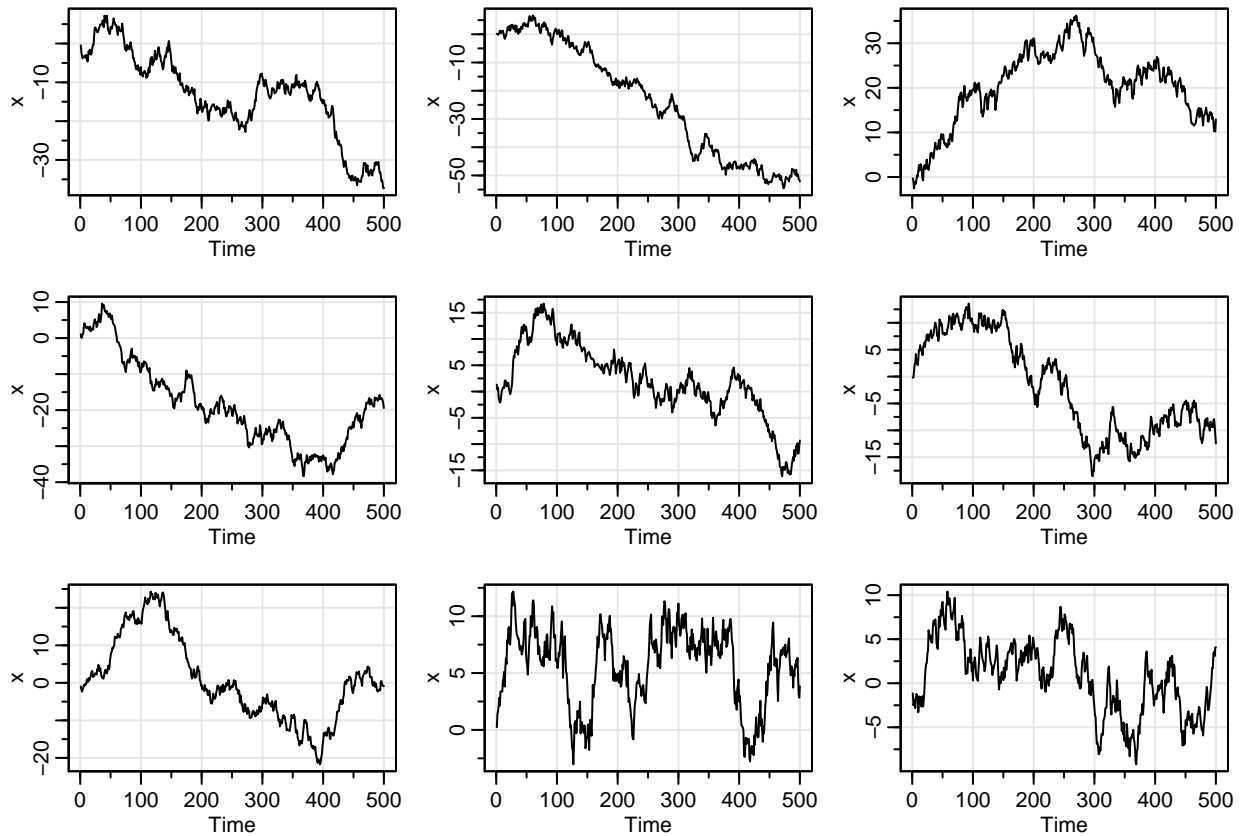
The main learning from this exercise was to smooth out the noise of the time series data to better understand the trend.

### Problem 1.3

#### Part a)

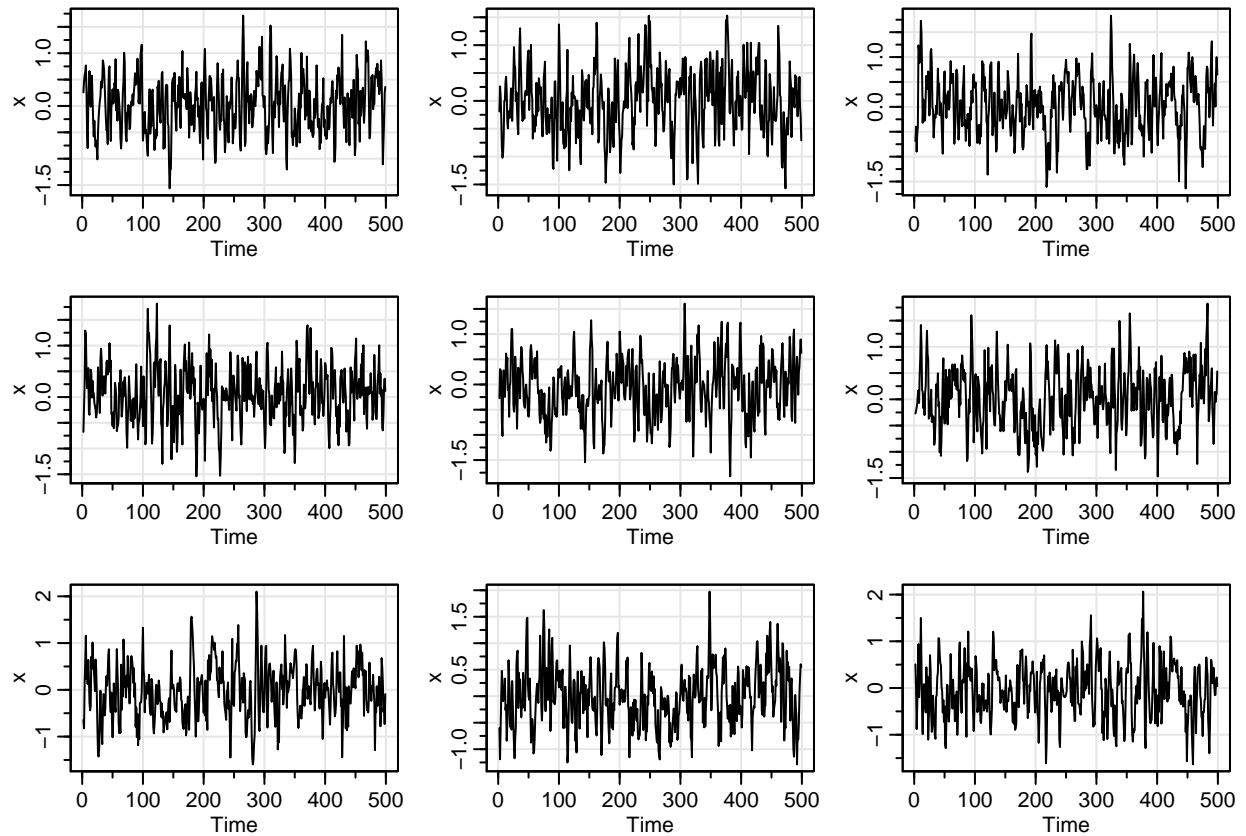
```
par(mfrow = c(3,3))
numberOfLoops <- 1:9
for (number in numberOfLoops)
{
  w = rnorm(500)
  x = cumsum(w)
```

```
tsplot(x)
}
```



Part b)

```
set.seed(123)
par(mfrow = c(3,3))
numberOfLoops <- 1:9
for (number in numberOfLoops)
{
  w = rnorm(500)
  x = filter(w,sides=2,filter=rep(1/3,3))
  tsplot(x)
}
```



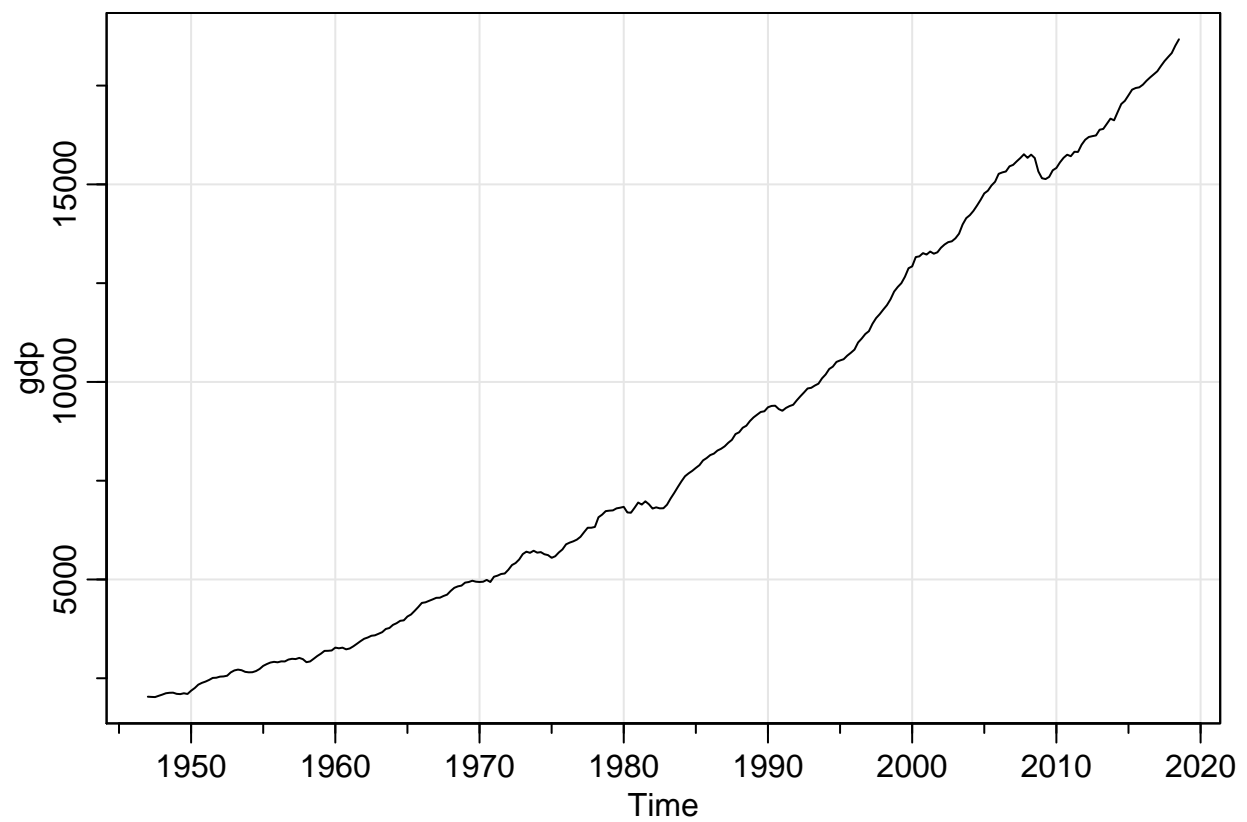
### Part c)

Difference between the two graphs is that plots in figure b) mean oscillates around zero and figure a) is random walk which is random from the previous value.

## Problem 1.4

### Part a)

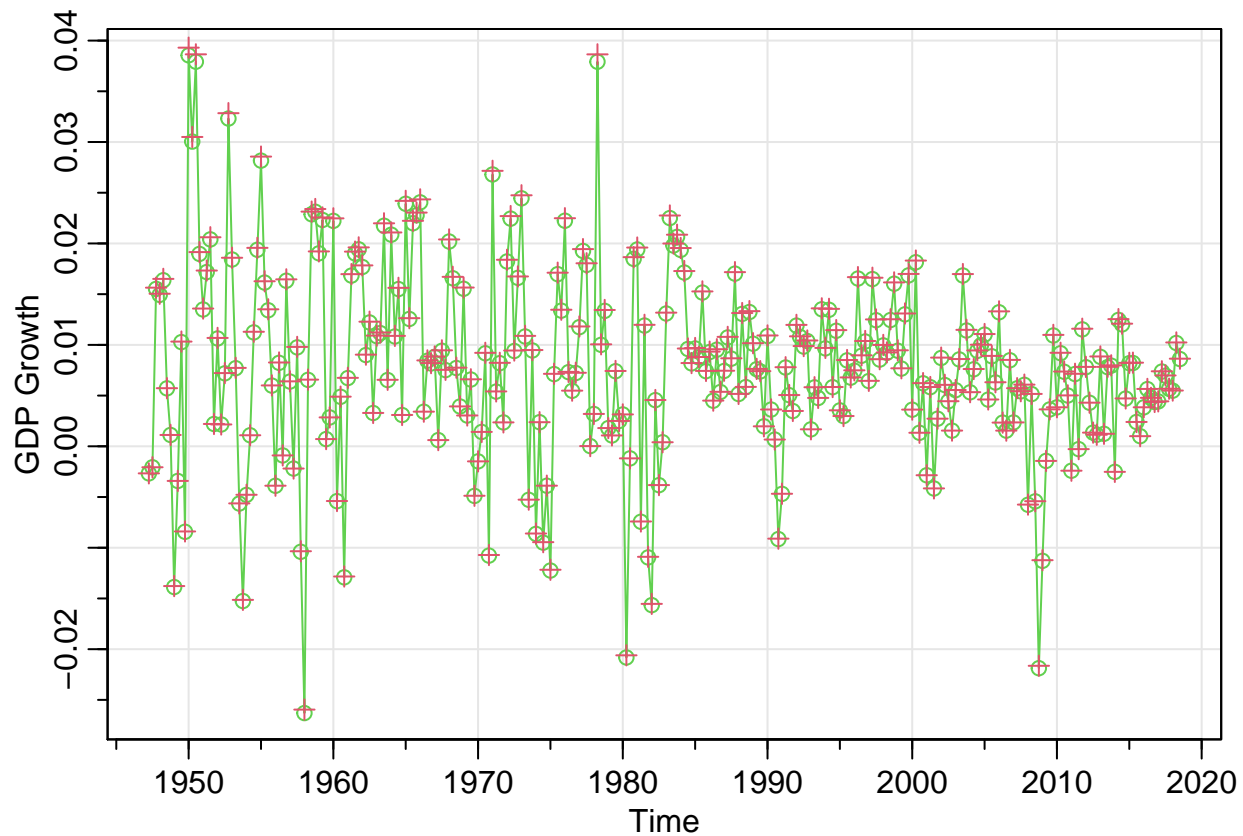
```
tsplot(gdp)
```



This trend looks closer to random walk with drift.

Part b)

```
tsplot(diff(log(gdp)), type = "o", col=3, ylab="GDP Growth")  
points(diff(gdp)/lag(gdp,-1), pch=3, col=2)
```



Both are giving similar results but logs are associated with percentage of growth, so an additive trend, whereas actual growth relates to multiplicative trend.

### Part c)

The growth of GDP looks similar to auto regression with added white noise.