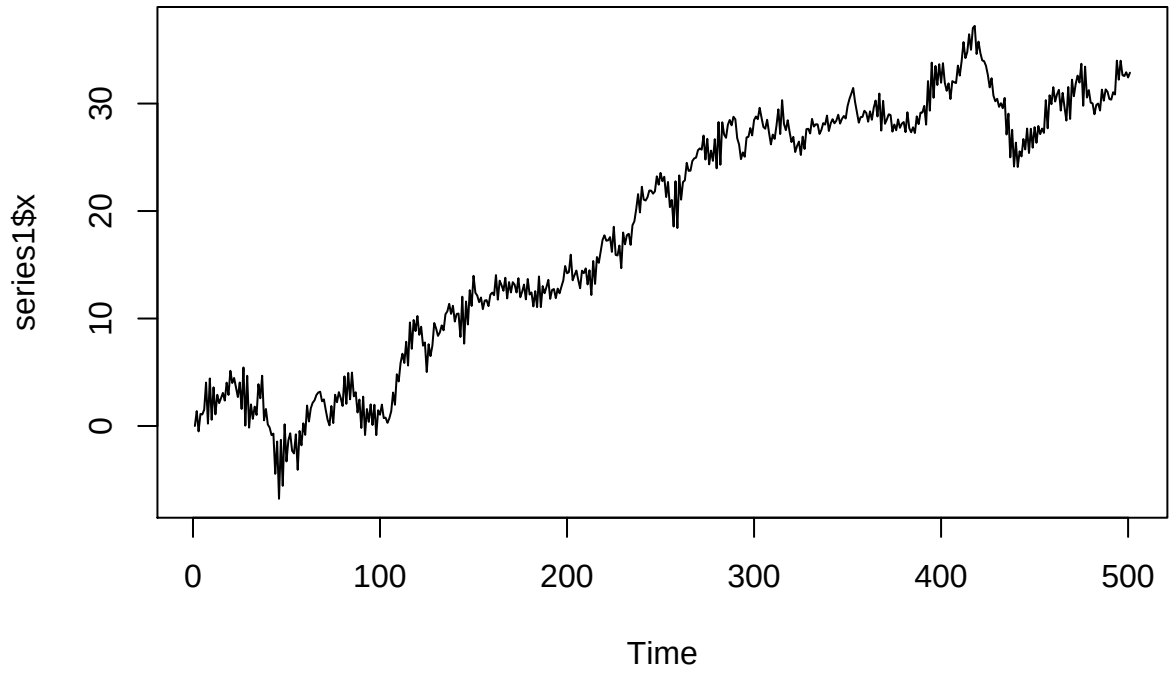
Time Series hw5

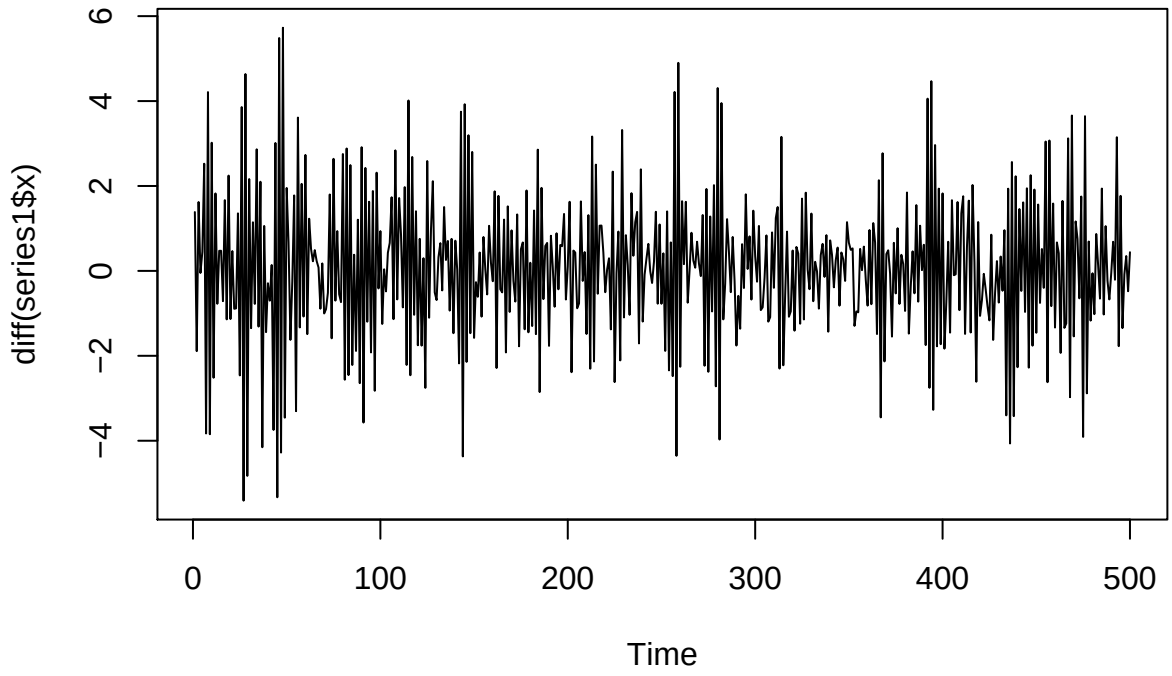
1. arima1 not stationary

```
plot.ts(series1$x)
```



D=1 seems stationary.

```
plot.ts(diff(series1$x))
```



seems stationary

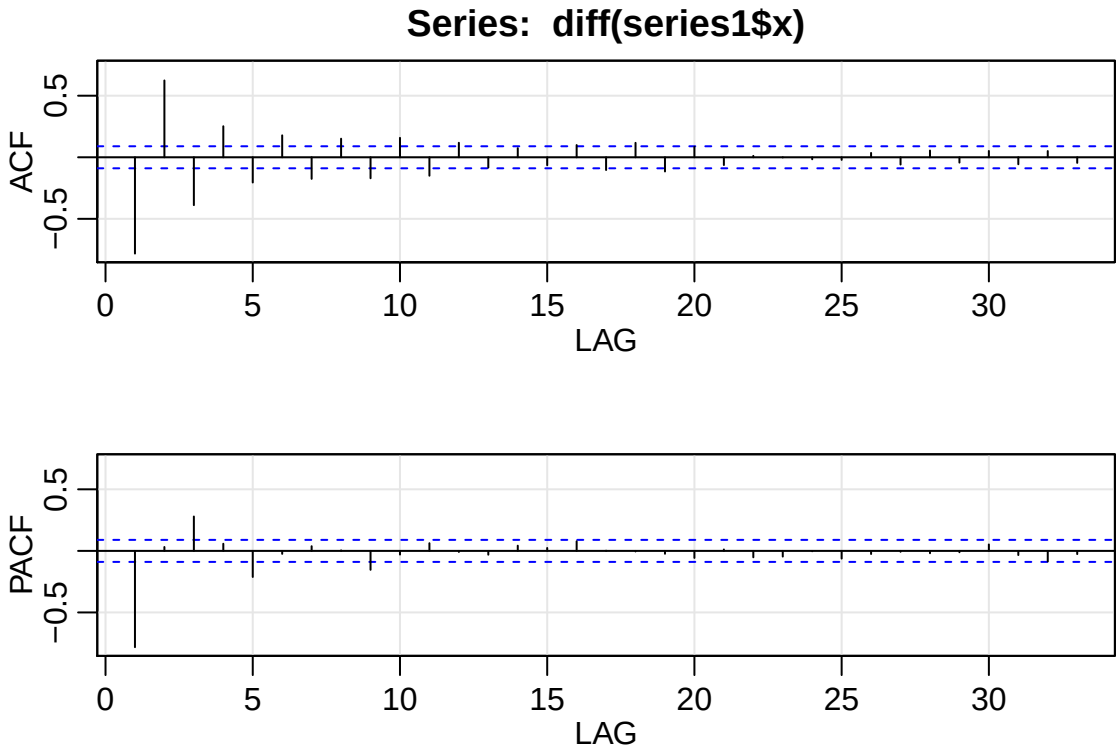
```
adf.test(diff(series1$x),alternative="stationary",k=20)
```

```
## Warning in adf.test(diff(series1$x), alternative = "stationary", k = 20):
## p-value smaller than printed p-value
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  diff(series1$x)
## Dickey-Fuller = -4.8802, Lag order = 20, p-value = 0.01
## alternative hypothesis: stationary
```

the residuals for (p,d,q)=(3,1,3) seems reasonable.

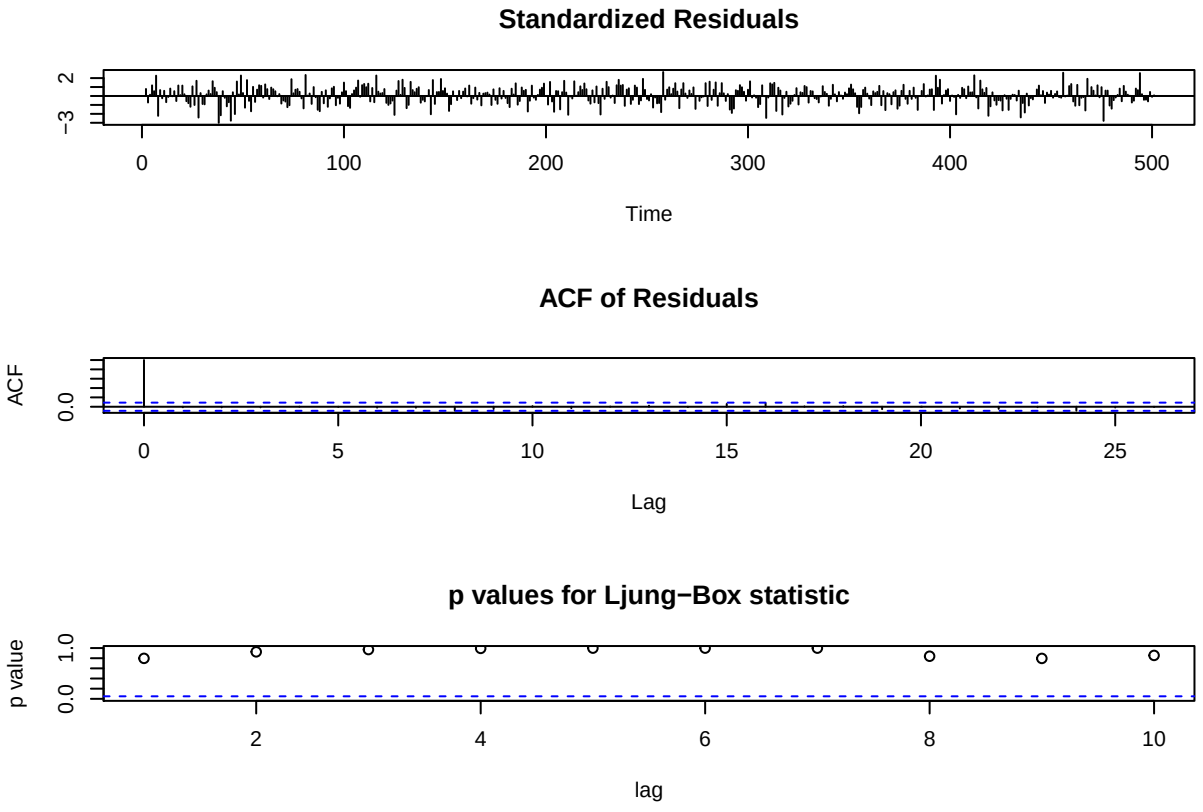
```
acf2(diff(series1$x))
```




```
##          ACF  PACF
##  [1,] -0.78 -0.78
##  [2,]  0.62  0.03
##  [3,] -0.39  0.28
##  [4,]  0.25  0.06
##  [5,] -0.21 -0.21
##  [6,]  0.18 -0.02
##  [7,] -0.18  0.04
##  [8,]  0.15  0.00
##  [9,] -0.17 -0.15
## [10,]  0.16 -0.03
## [11,] -0.15  0.06
## [12,]  0.12 -0.01
## [13,] -0.08 -0.03
## [14,]  0.07  0.04
## [15,] -0.06  0.02
```

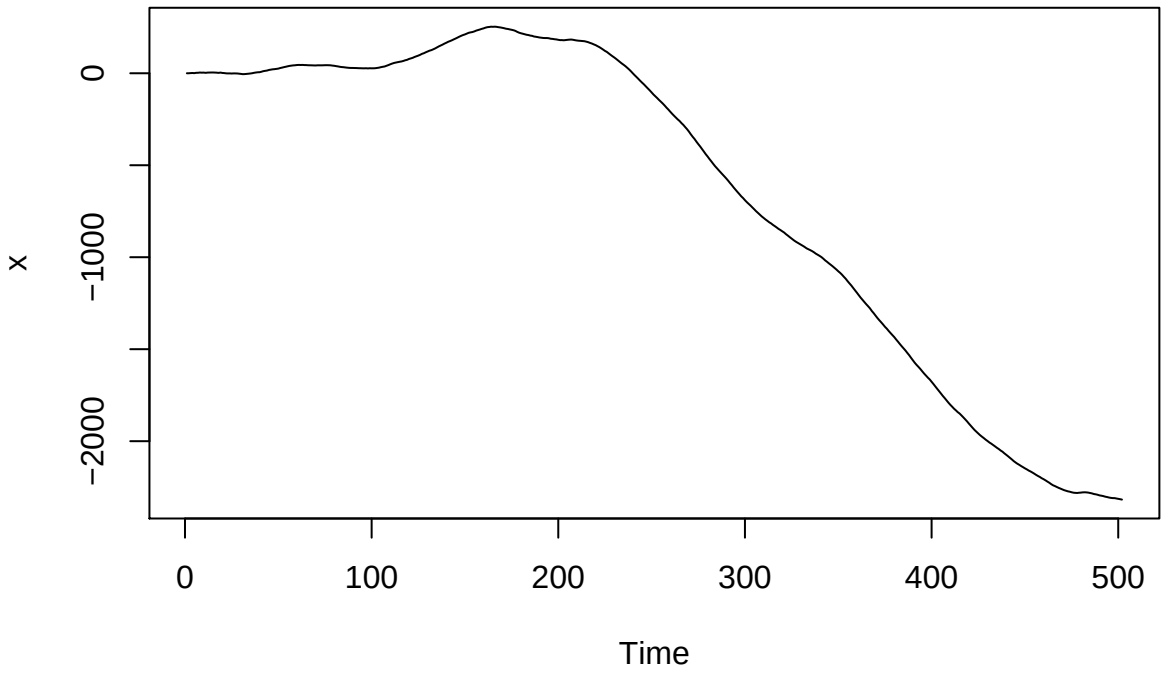
```
## [16,]  0.10  0.08
## [17,] -0.10  0.00
## [18,]  0.12  0.00
## [19,] -0.12 -0.02
## [20,]  0.09 -0.06
## [21,] -0.06  0.01
## [22,]  0.01 -0.05
## [23,]  0.00 -0.05
## [24,] -0.02  0.00
## [25,] -0.02 -0.06
## [26,]  0.04 -0.03
## [27,] -0.06 -0.01
## [28,]  0.05 -0.02
## [29,] -0.04 -0.01
## [30,]  0.05  0.05
## [31,] -0.06 -0.03
## [32,]  0.05 -0.09
## [33,] -0.05 -0.03
```

```
res1=arima(series1$x,c(3,1,3))
tsdiag(res1)
```



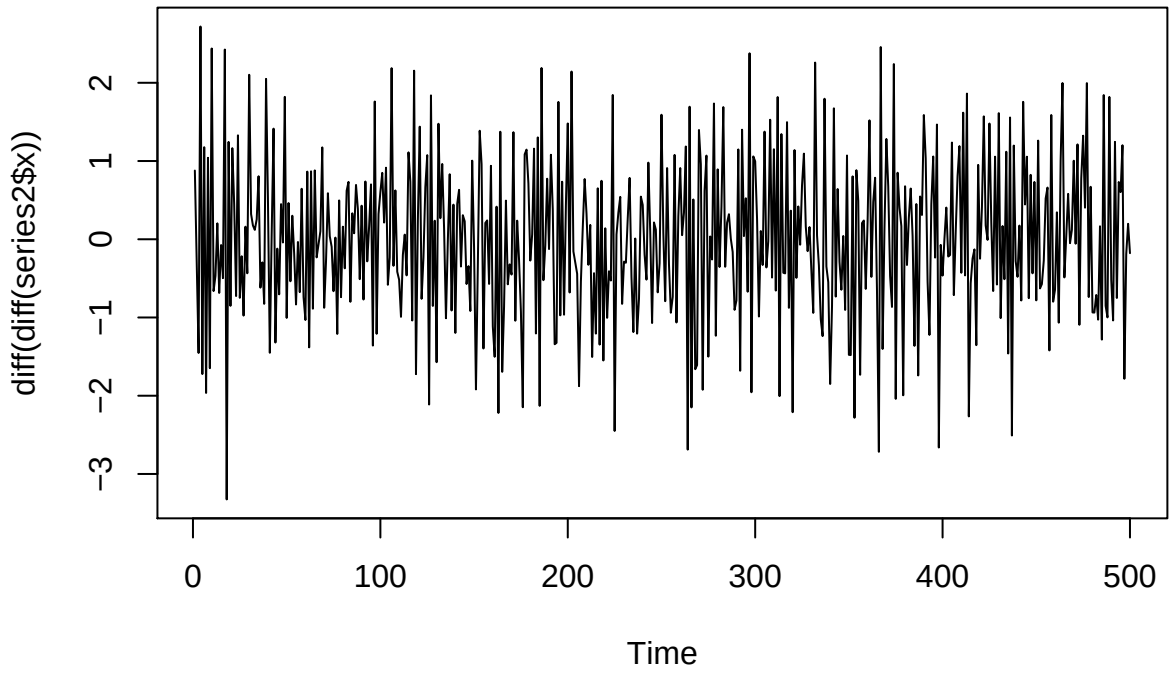
2. arima2 not stationary

```
plot.ts(series2)
```



D=2 seems stationary.

```
plot.ts(diff(diff(series2$x)))
```



seems stationary

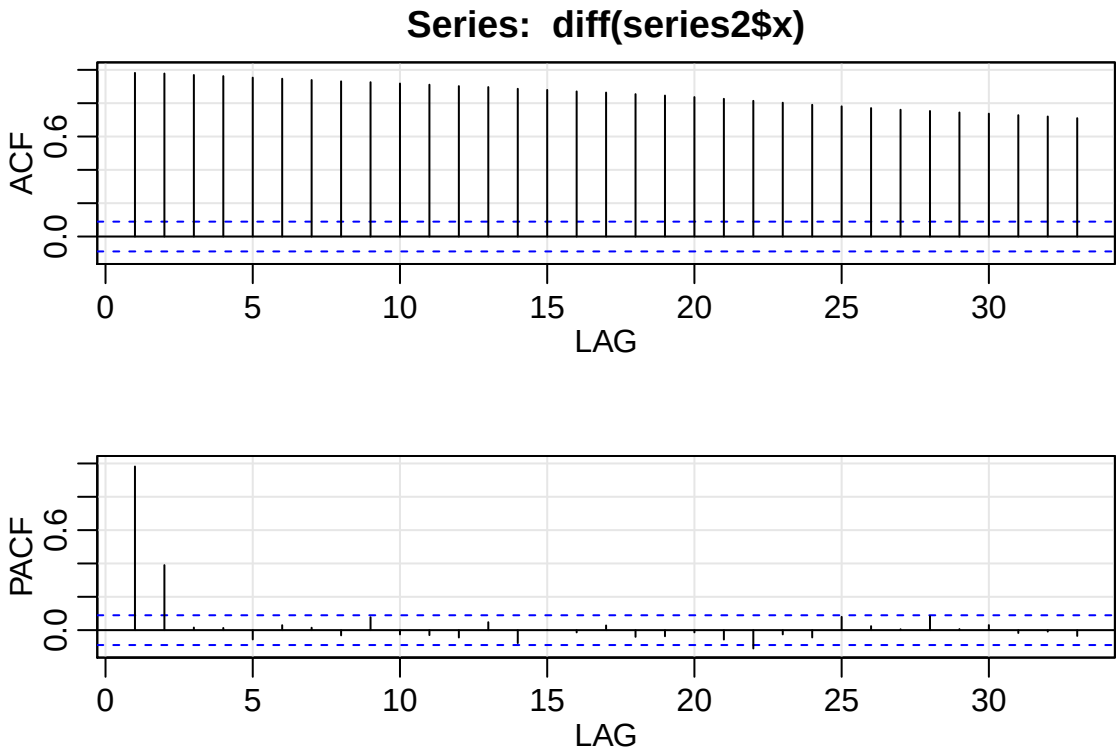
```
adf.test(diff(diff(series2$x)),alternative="stationary",k=20)
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  diff(diff(series2$x))
## Dickey-Fuller = -3.6997, Lag order = 20, p-value = 0.02402
```

```
## alternative hypothesis: stationary
```

the residuals for (p,d,q)=(2,2,3) seems reasonable.

```
acf2(diff(series2$x))
```



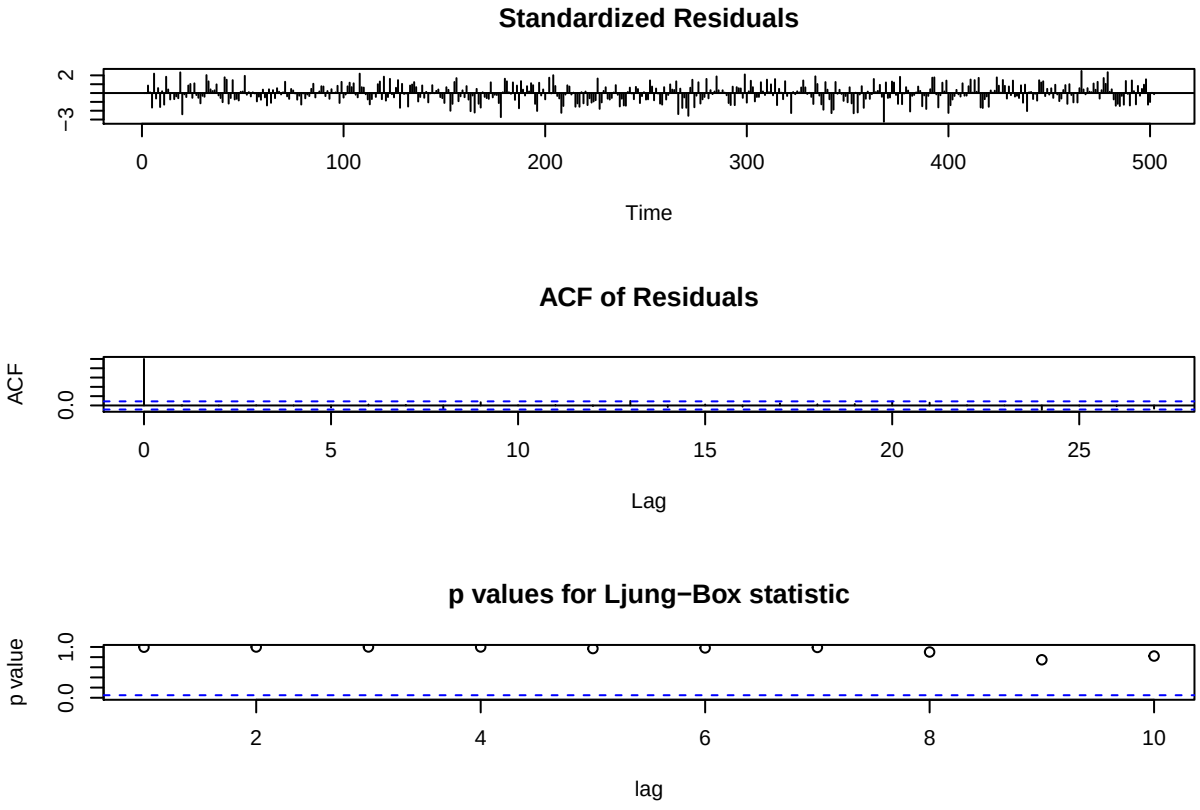

```
##         ACF  PACF
##  [1,] 0.98  0.98
##  [2,] 0.98  0.39
##  [3,] 0.97  0.02
##  [4,] 0.96  0.01
##  [5,] 0.95 -0.06
##  [6,] 0.95  0.03
##  [7,] 0.94  0.01
##  [8,] 0.93 -0.03
##  [9,] 0.93  0.08
## [10,] 0.92 -0.03
## [11,] 0.91 -0.03
## [12,] 0.90 -0.04
## [13,] 0.90  0.05
## [14,] 0.89 -0.08
## [15,] 0.88  0.00
## [16,] 0.87 -0.01
## [17,] 0.86  0.03
## [18,] 0.85 -0.04
## [19,] 0.85 -0.04
## [20,] 0.84 -0.01
## [21,] 0.83 -0.06
## [22,] 0.81 -0.11
## [23,] 0.80 -0.03
## [24,] 0.79 -0.04
```

```
## [25,] 0.78  0.08
## [26,] 0.77  0.02
## [27,] 0.76  0.01
## [28,] 0.75  0.08
## [29,] 0.74  0.01
## [30,] 0.74  0.03
## [31,] 0.73 -0.02
## [32,] 0.72 -0.01
## [33,] 0.71 -0.03
```

```
res2=arima(series2$x,c(3,1,3))
```

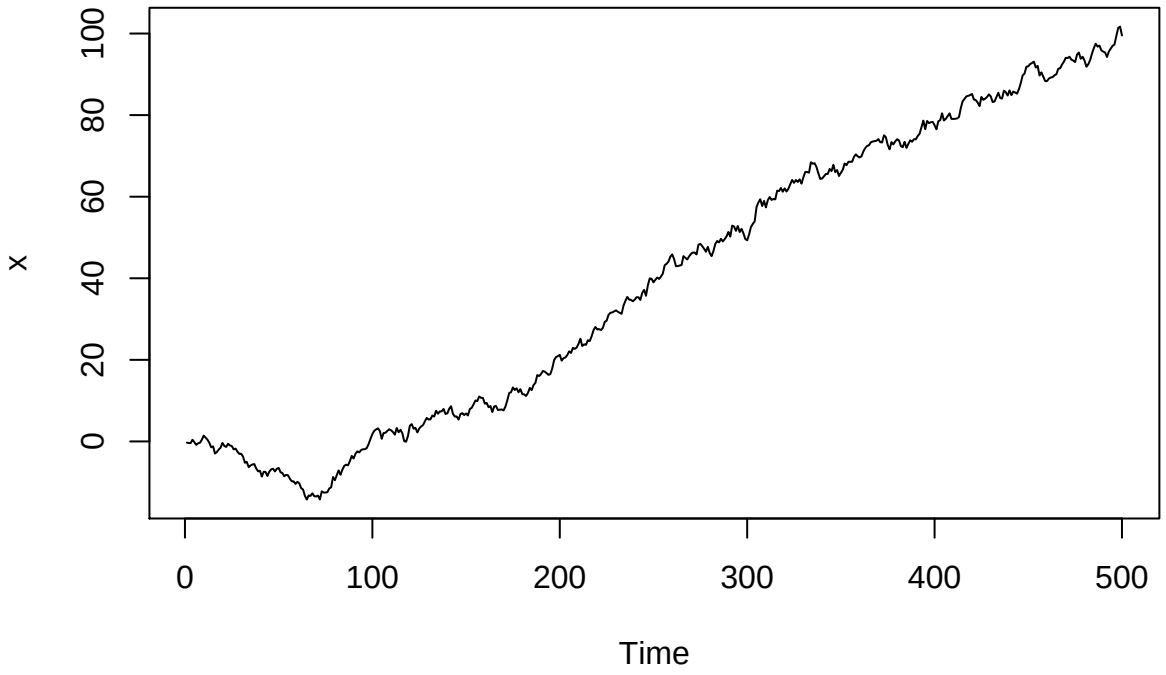
```
## Warning in arima(series2$x, c(3, 1, 3)): possible convergence problem:
## optim gave code = 1
```

```
tsdiag(res2)
```



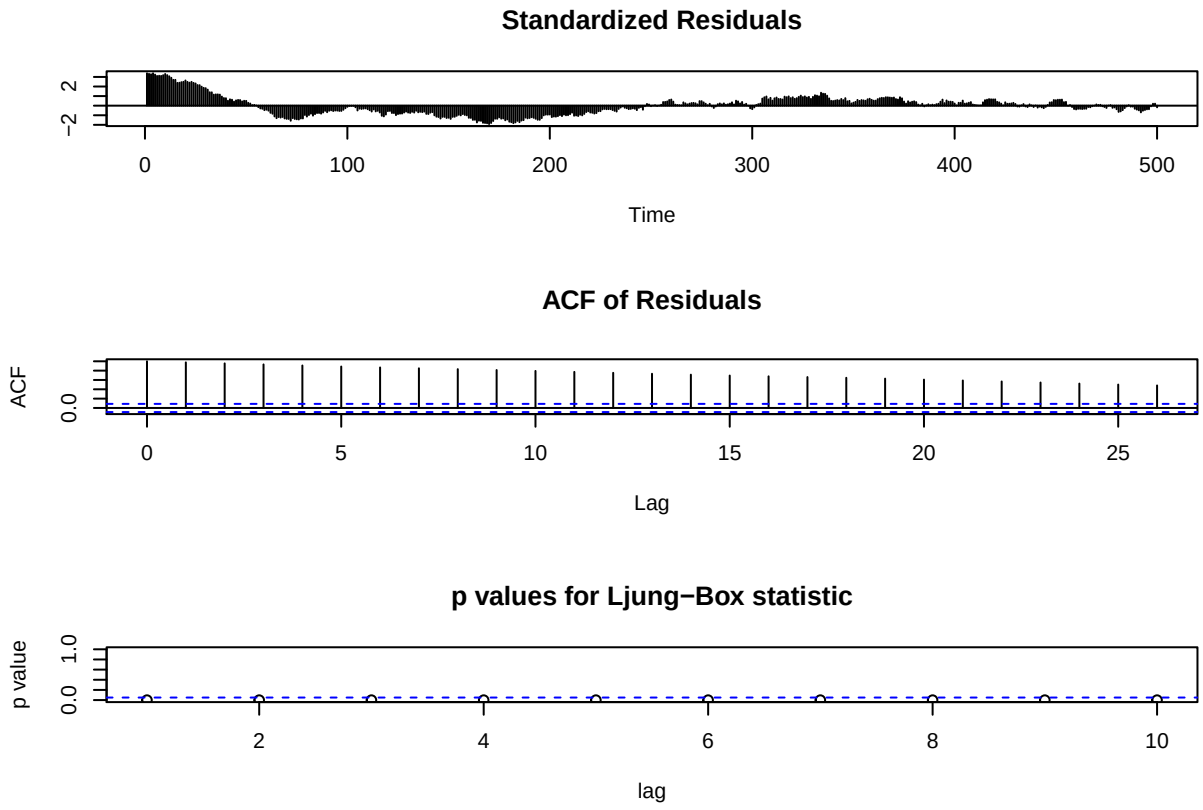
3. Random walk

```
plot.ts(rwalk)
```



the residual violate the assumption of white noise

```
time=1:500
tsdiag(arima(rwalk,order=c(0,0,0),xreg=time))
```



can't reject null hypothesis under significance level 0.05.

```
adf.test(rwalk$x,alternative="stationary",k=1)
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  rwalk$x
## Dickey-Fuller = -3.4266, Lag order = 1, p-value = 0.04937
## alternative hypothesis: stationary
```

The model fits well,since the residuals seems reasonable.

```
tsdiag(arima(rwalk,order=c(0,1,0),xreg=time))
```