STAT 443: Lab 2

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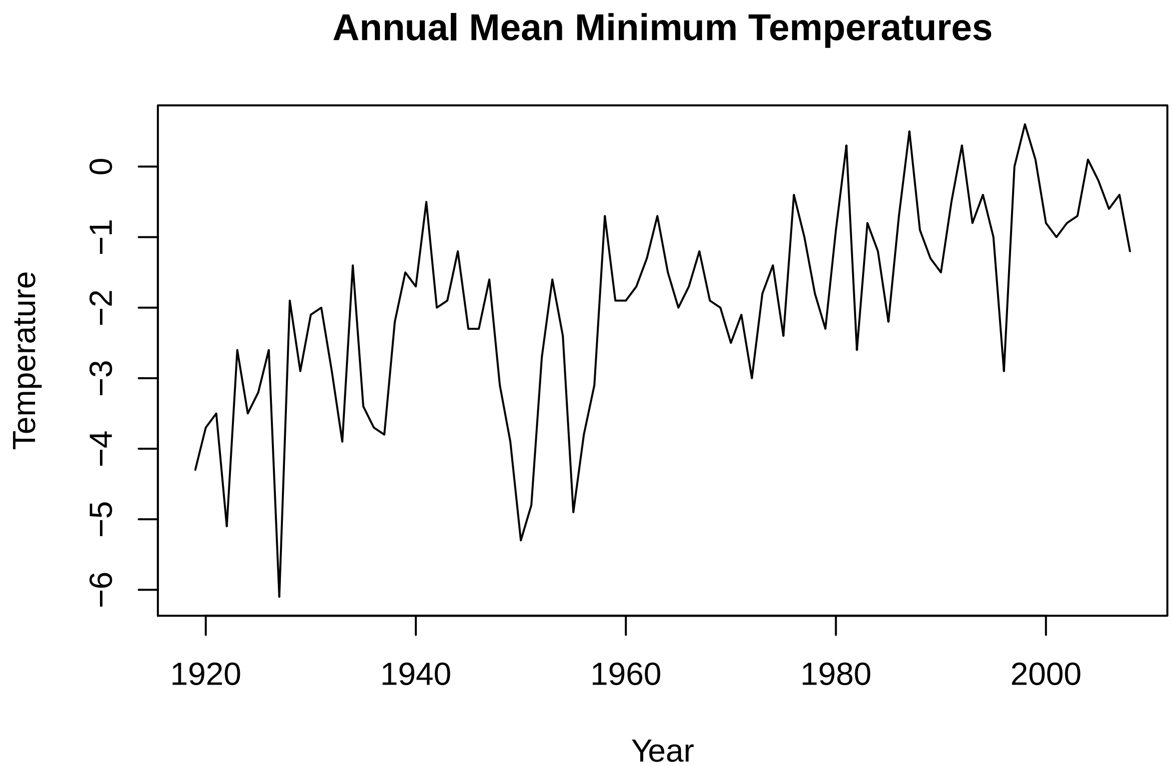
Question 1

(a)

```
# read the data
dat <- read_csv("dataTempPG (1).csv")
```

```
##
## -- Column specification --------------------------------------------------------
## cols(
##   Year = col_double(),
##   Jan = col_double(),
##   Feb = col_double(),
##   Mar = col_double(),
##   Apr = col_double(),
##   May = col_double(),
##   Jun = col_double(),
##   Jul = col_double(),
##   Aug = col_double(),
##   Sep = col_double(),
##   Oct = col_double(),
##   Nov = col_double(),
##   Dec = col_double(),
##   Annual = col_double(),
##   Winter = col_double(),
##   Spring = col_double(),
##   Summer = col_double(),
##   Autumn = col_double()
## )
```

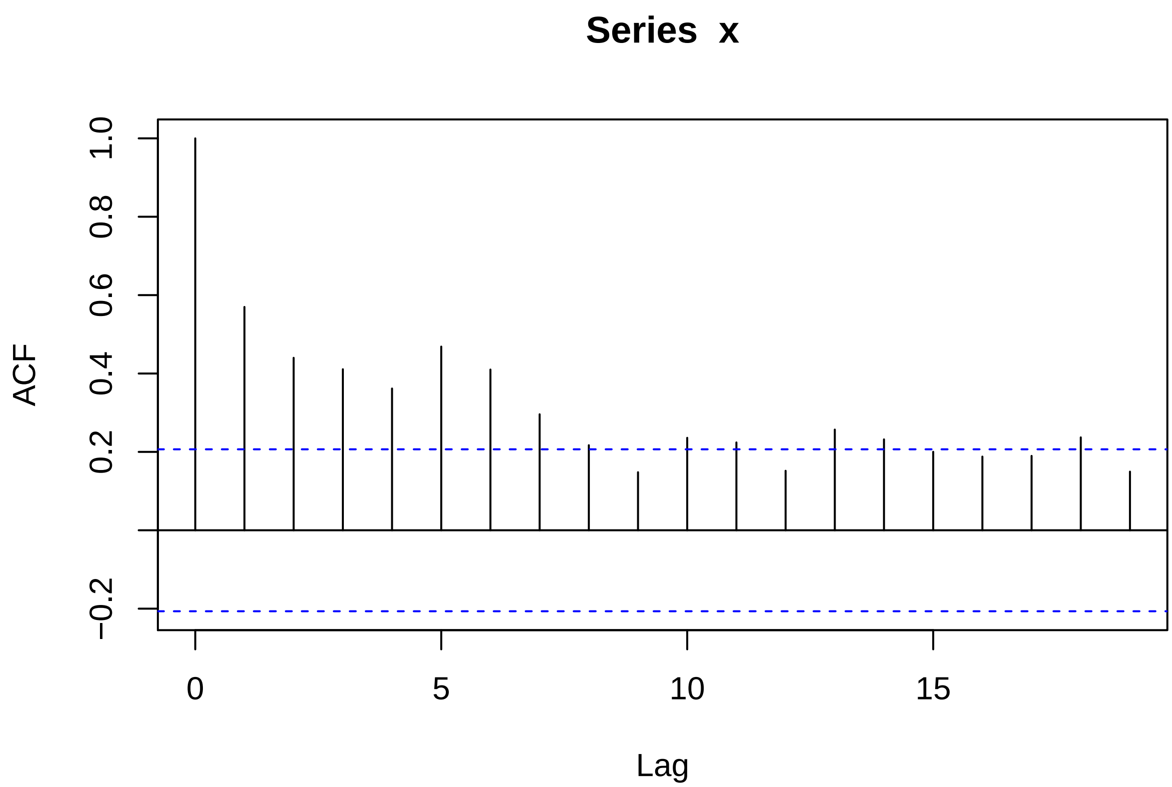
```
x = ts(data = dat$Annual, start = c(1919), frequency = 1)
plot(x, main = "Annual Mean Minimum Temperatures", xlab = "Year", ylab = "Temperature")
```



This plot demonstrates an upwards sloping trend as annual mean minimum temperature gradually increases. In some years, we see a large dip in temperature (such as 1955).

(b)

```
acf(x)
```

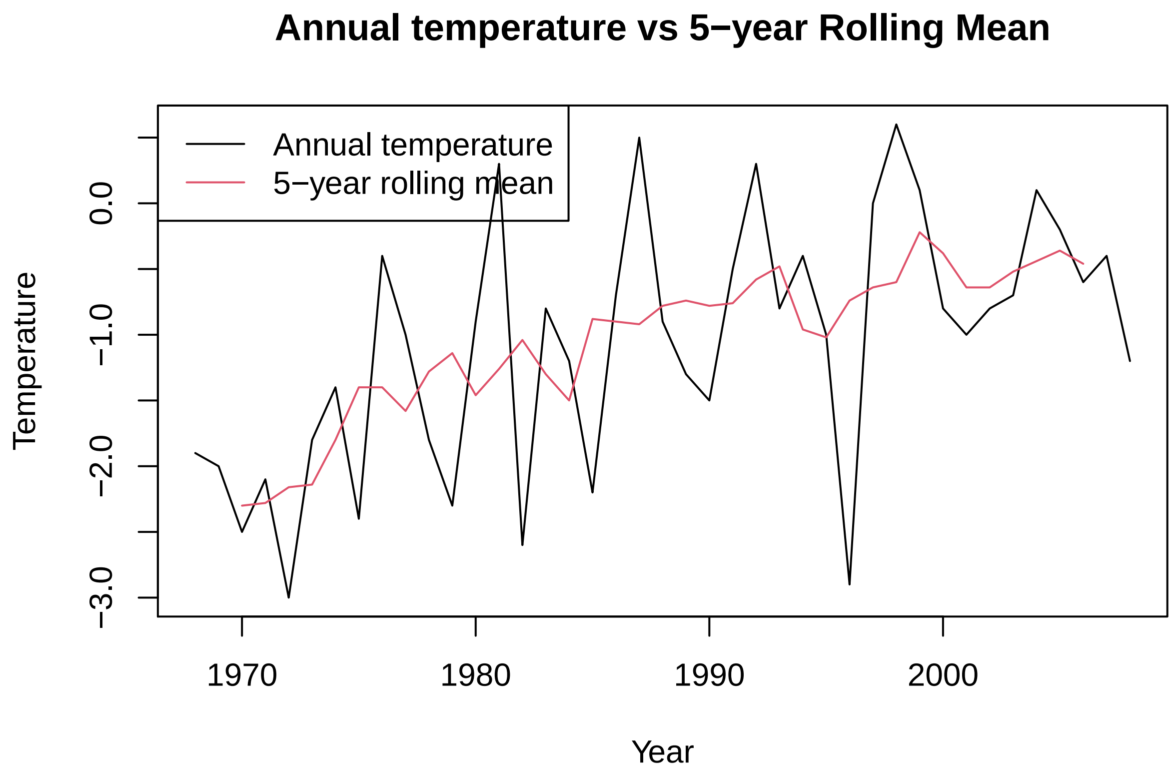


The acf function has a cut-off at lag 0. It also shows a decaying pattern as the lag increases.

(c)

```
data_window = window(x, start=1968, end=2008)
plot(data_window, xlab="Year", ylab="Temperature", main="Annual temperature vs 5-year Rolling Mean")
lines(rollmean(data_window, k=5), col=2)

#legend keys
legend("topleft",legend=c("Annual temperature","5-year rolling mean"), lty=1,col=c(1,2))
```



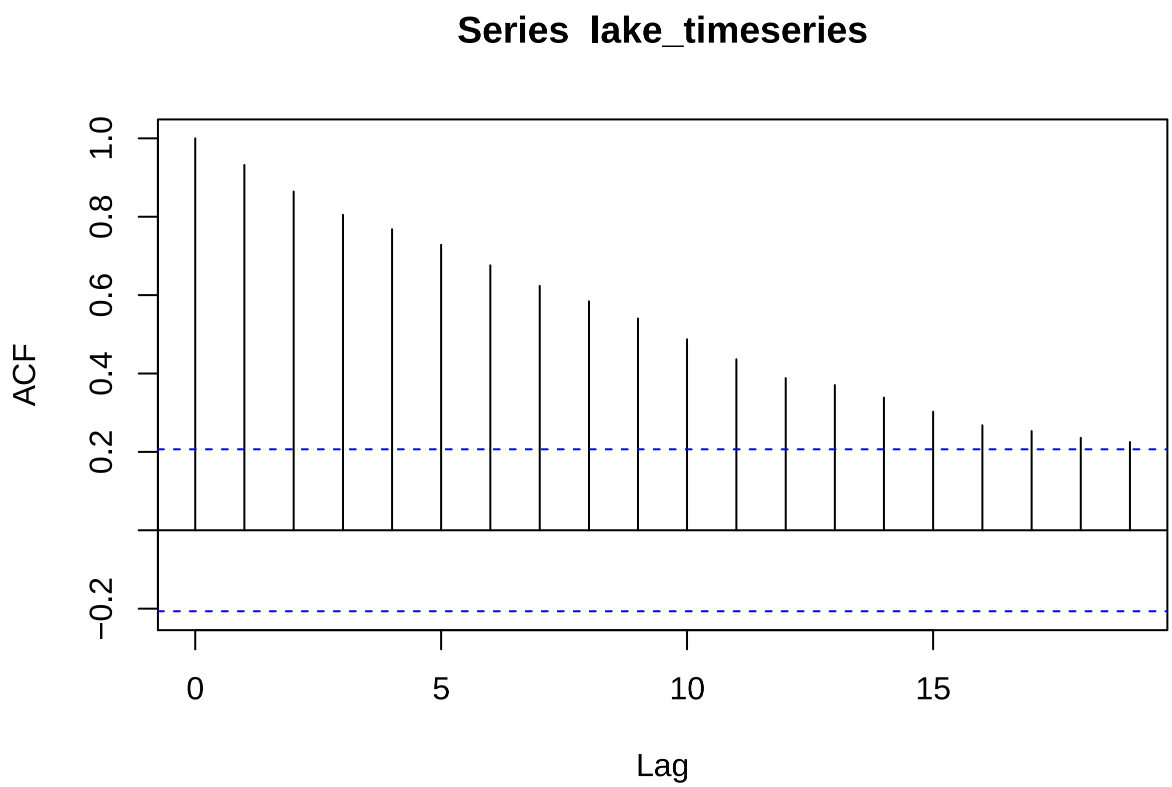
Question 2

(a)

```
#lag.max as a multiple of the period of seasonality.
lake_data <-  read_csv("LakeLevels (1).csv")
```

```
##
## -- Column specification --------------------------------------------------------
## cols(
##   Date = col_character(),
##   LakeLevel = col_double()
## )
```

```
lake_timeseries = ts(data=lake_data$LakeLevel, start = 1, end = nrow(dat))
acf(lake_timeseries)
```

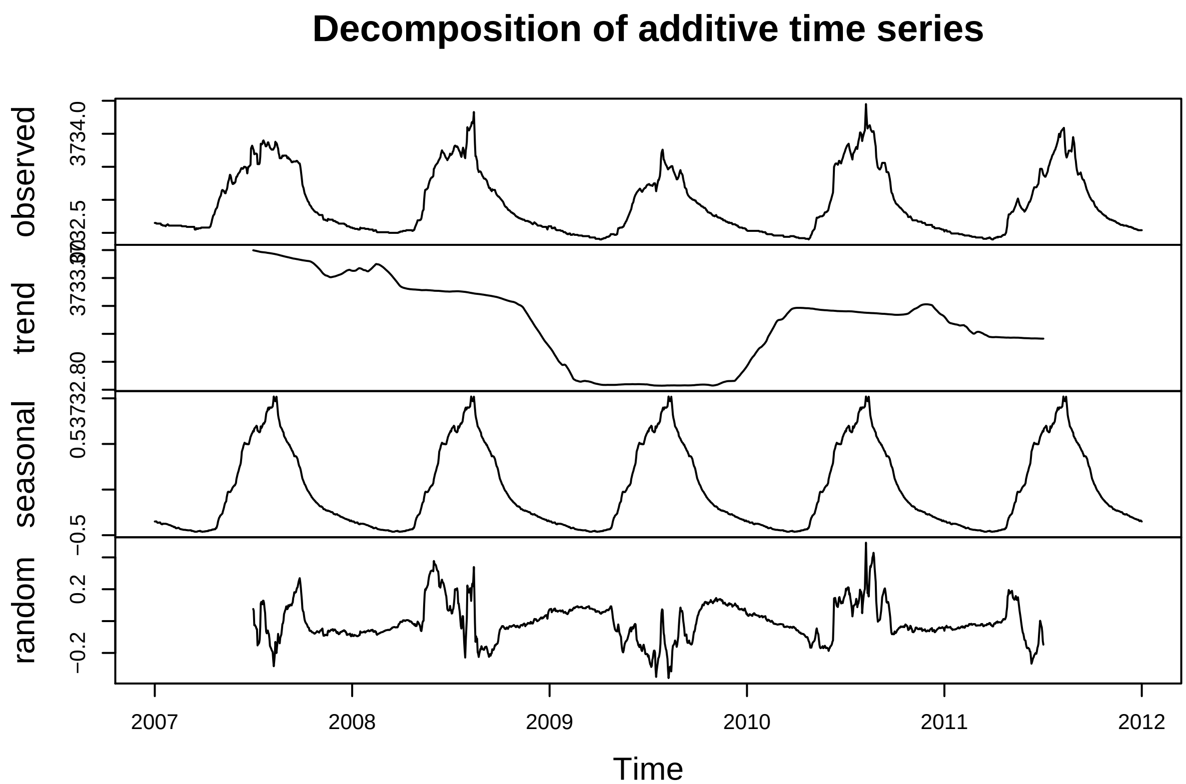


The acf function looks to be decaying as lag increases.

b)

```
lake_timeseries = ts(data=lake_data$LakeLevel, start = c(2007, 1), frequency = 365)

dat.decom <- decompose(lake_timeseries, type="additive")
plot(dat.decom)
```

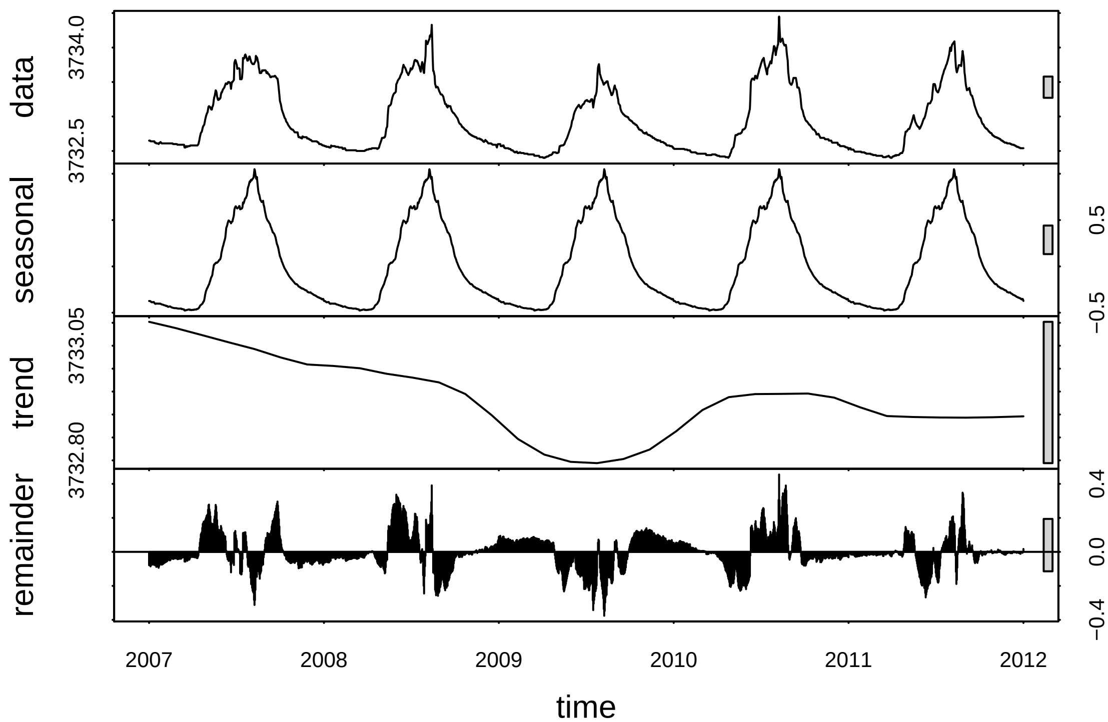



```
trend <- dat.decom$trend # this is the same as rollmean(level, k=365)
seas <- dat.decom$seasonal # simple seasonal effect estimation using averaging
error <- dat.decom$random # the remaining term
```

(c)

```
lev.stl <- stl(lake_timeseries, s.window="periodic")
trend <- lev.stl$time.series[,"trend"]
seas <- lev.stl$time.series[,"seasonal"]
error <- lev.stl$time.series[,"remainder"]

plot(lev.stl)
```


data
seasonal
trend
remainder
3734.0
3732.5
0.5
−0.5
3733.05
3732.80
0.4
0.0
−0.4
2007
2008
2009
2010
2011
2012
time