STAT 443: Lab 10

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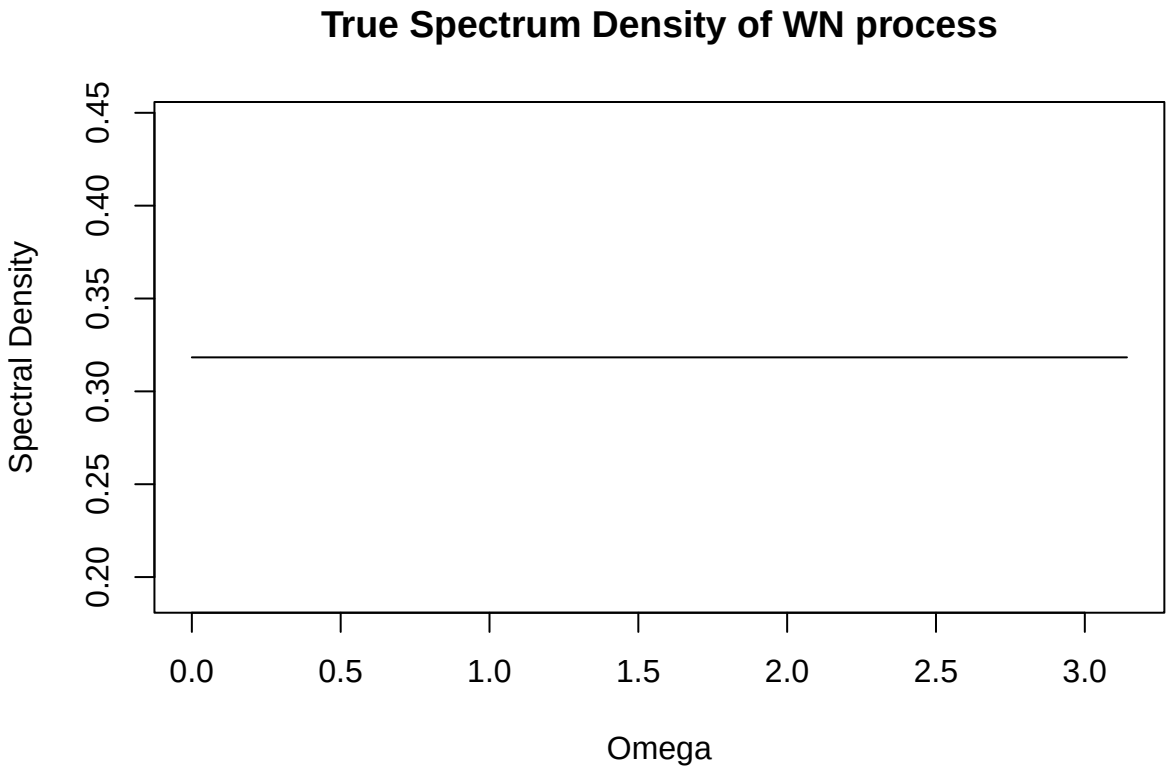
27 March, 2023

Question 1

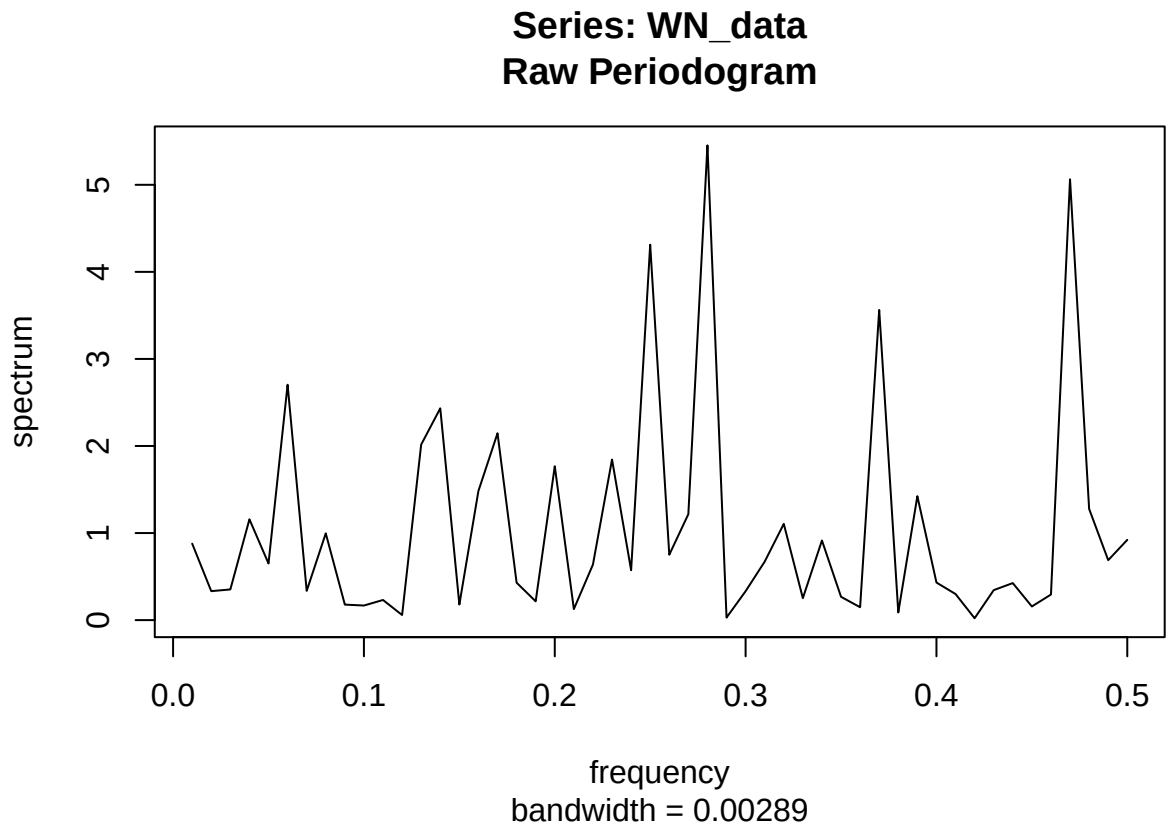
a)

```
omega <- seq(0, pi, length=100)
y <- dunif(omega, min = 0, max = pi)
plot(omega, y,
     type = 'l',
     main = "True Spectrum Density of WN process",
     ylab = "Spectral Density",
     xlab = "Omega")
```



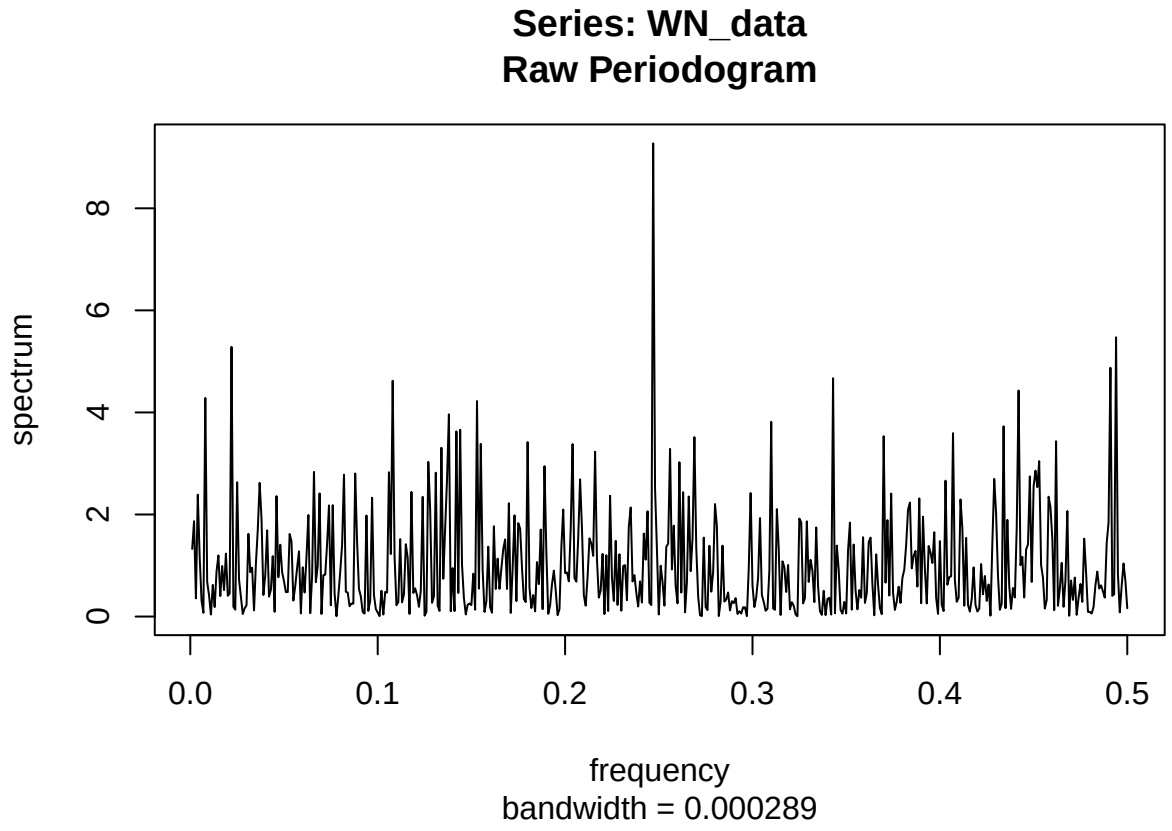
b)

```r
n = 100
WN_data <- ts(rnorm(n,0,1))
spec.pgram(WN_data, log = "no")
```



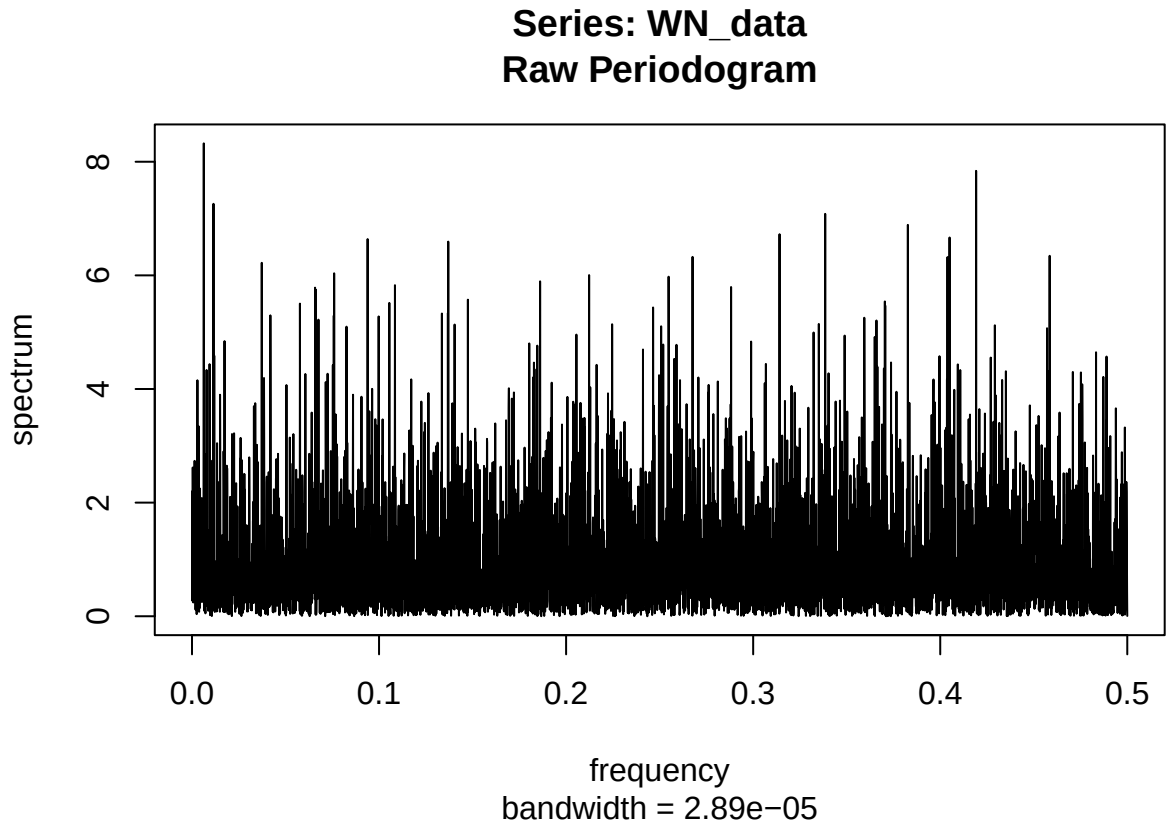
c)

```r
n = 1000
WN_data <- ts(rnorm(n,0,1))
spec.pgram(WN_data, log = "no")
```

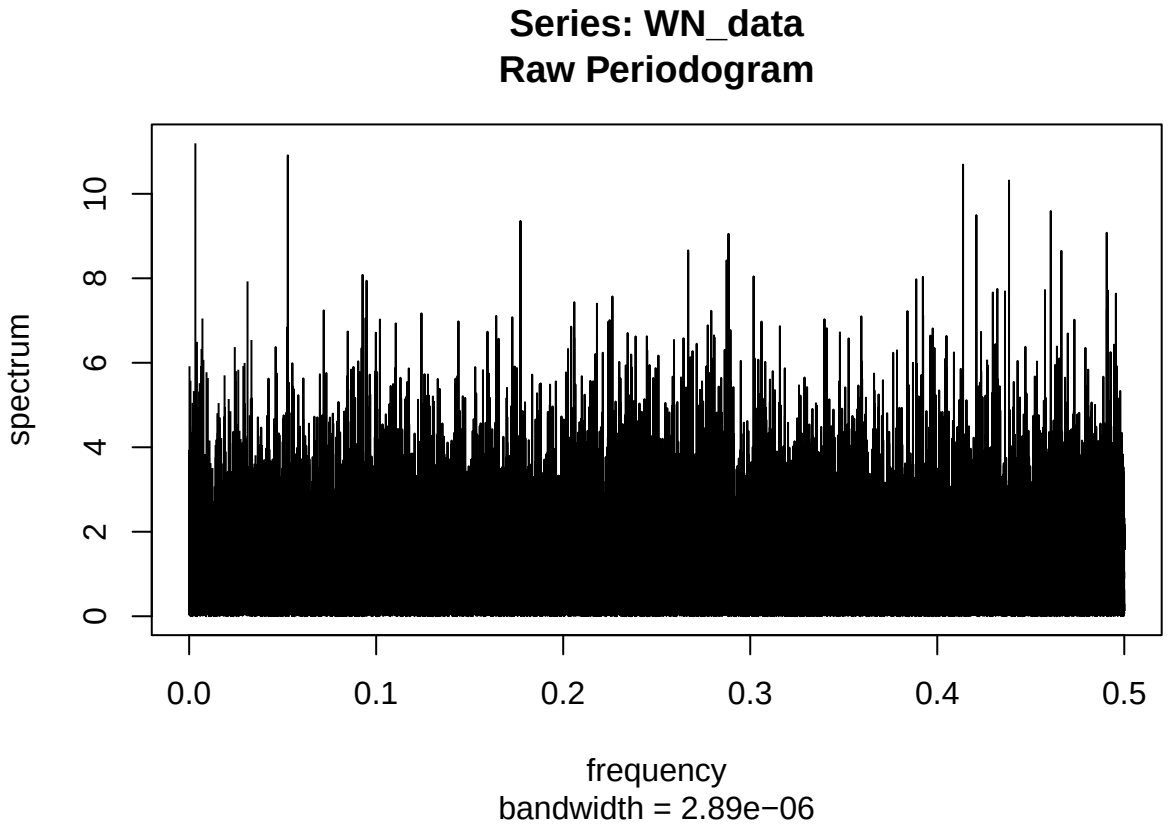


d)

```
n = 10000
WN_data <- ts(rnorm(n,0,1))
spec.pgram(WN_data, log = "no")
```



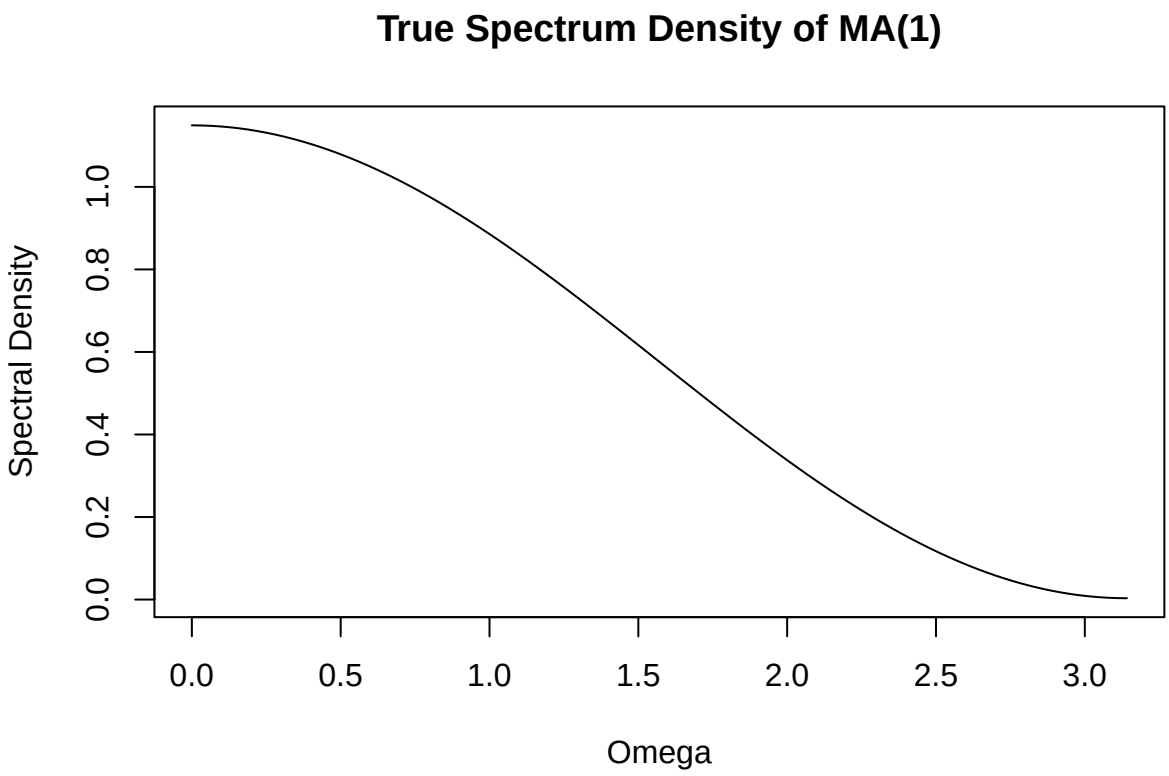

```
n = 100000
WN_data <- ts(rnorm(n,0,1))
spec.pgram(WN_data, log = "no")
```



Question 2

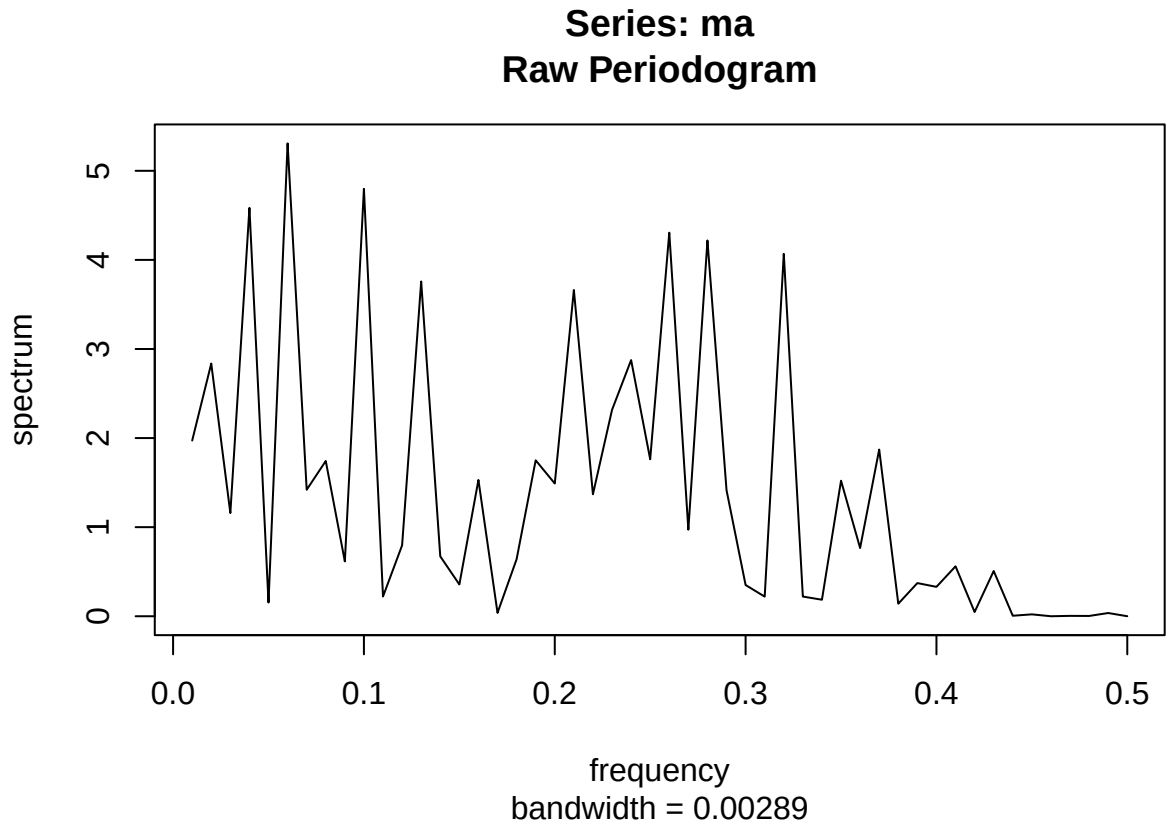
a)

```
f_omega <- function(omega,beta = 0.9,simga = 1) {
  f_star = (1/pi)*(1 + (2*beta*cos(omega))/(1+beta^2))
  f = (1+beta^2)*simga^2*f_star
  return(f)
}
curve(f_omega,
      from = 0,
      to = pi,
      main = "True Spectrum Density of MA(1)",
      ylab = "Spectral Density",
      xlab = "Omega")
```

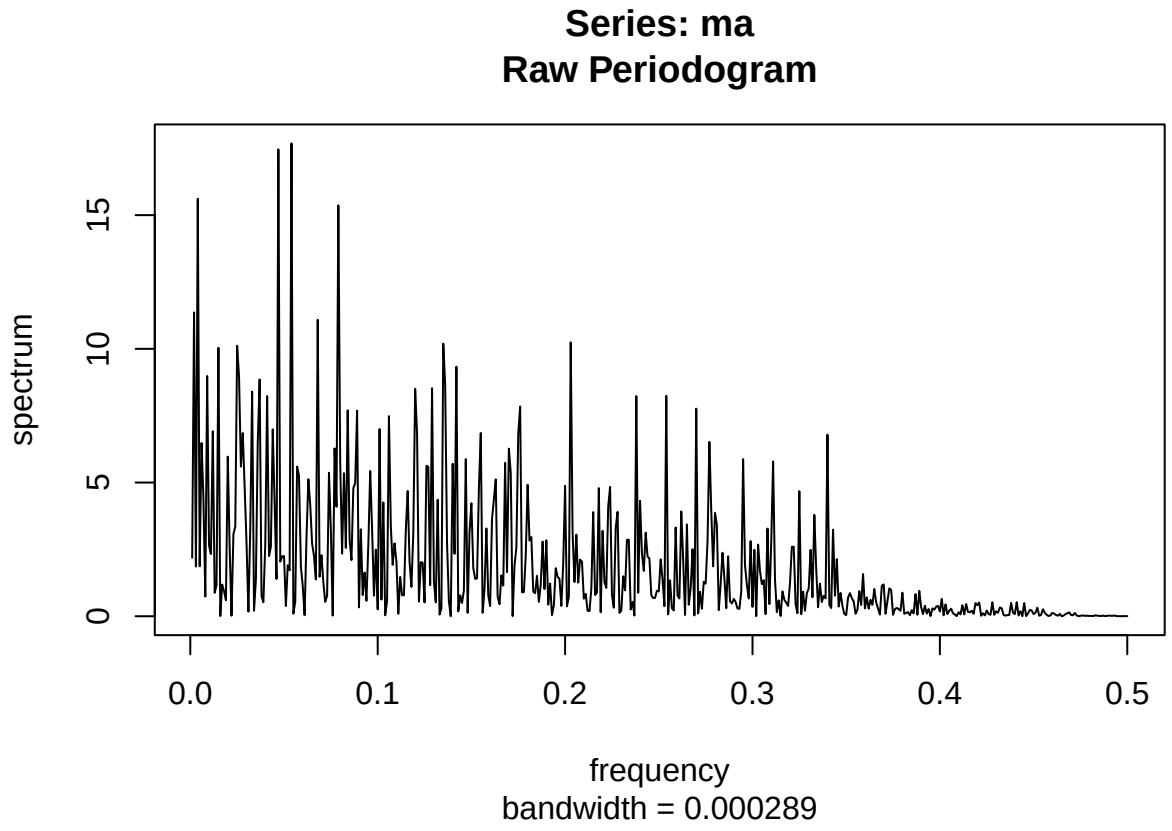


b)

```r
ma <- arima.sim(n = 100, model = list(ma = c(0.9)), sd = sqrt(1))
spec.pgram(ma, log = "no")
```

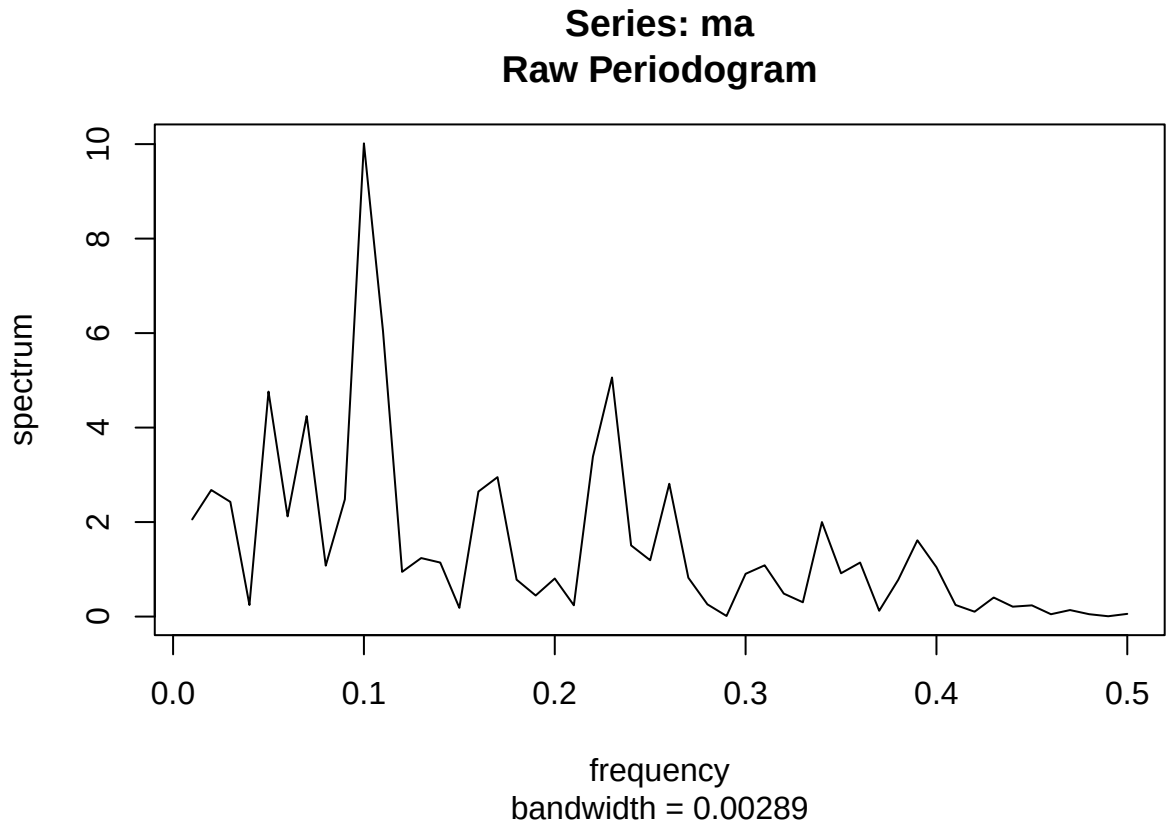



```
ma <- arima.sim(n = 1000, model = list(ma = c(0.9)), sd = sqrt(1))
spec.pgram(ma, log = "no")
```

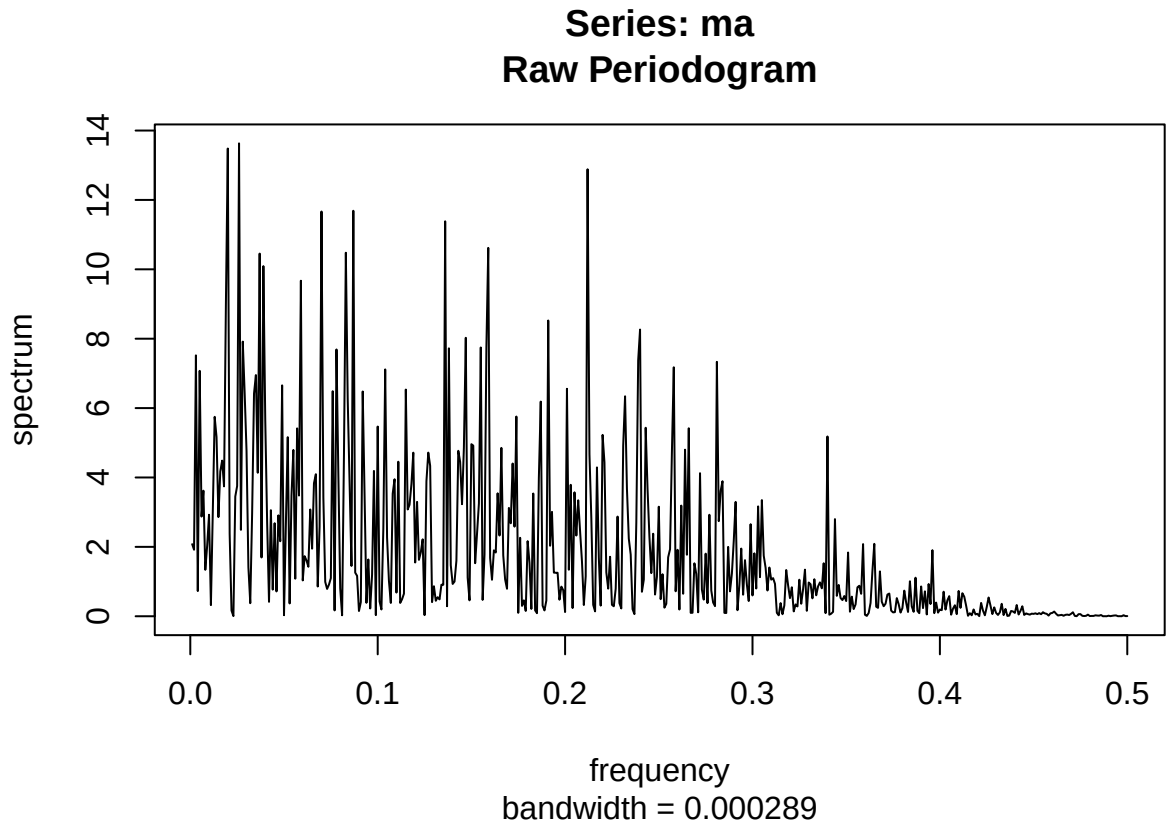


d)

```
ma <- arima.sim(n = 100, model = list(ma = c(0.9)), sd = sqrt(1))
spec.pgram(ma, log = "no")
```



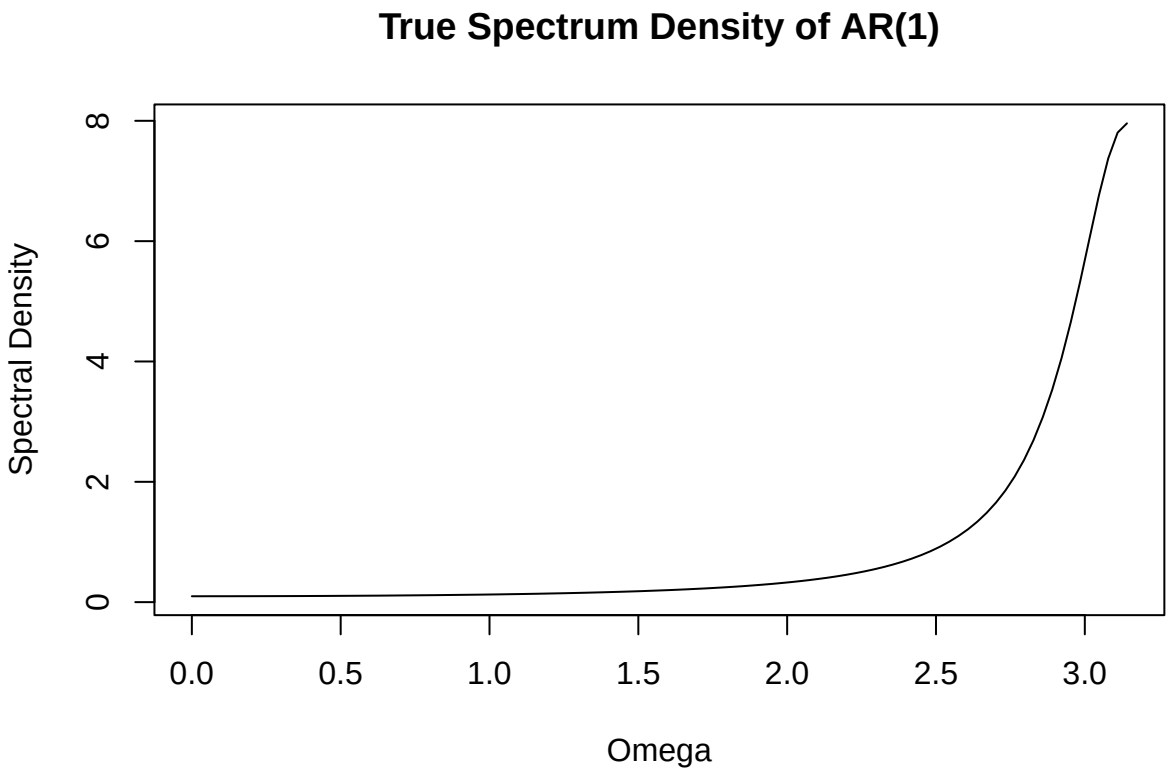

```r
ma <- arima.sim(n = 1000, model = list(ma = c(0.9)), sd = sqrt(1))
spec.pgram(ma, log = "no")
```



Question 3

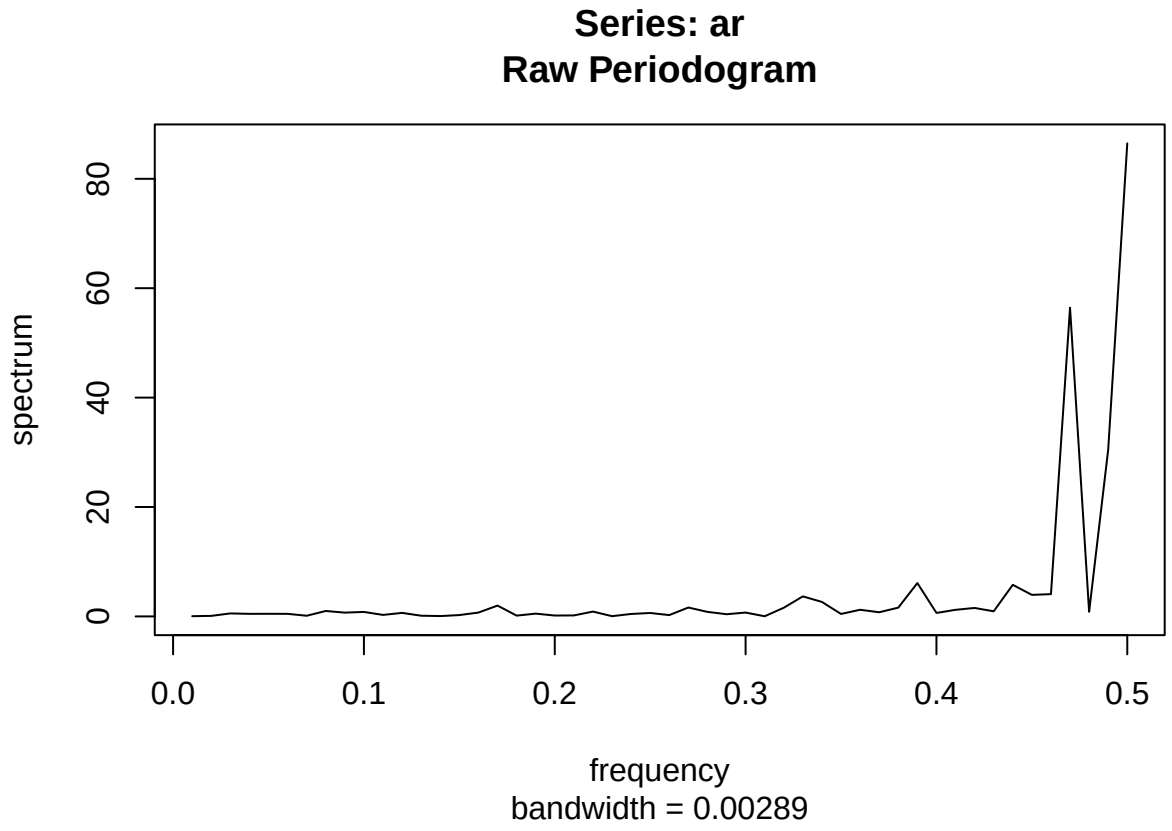
a)

```
f_omega <- function(omega) {
  f = 1/(pi*(1 + 1.6*cos(omega) + 0.8^2))
  return(f)
}
curve(f_omega,
      from = 0,
      to = pi,
      main = "True Spectrum Density of AR(1)",
      ylab = "Spectral Density",
      xlab = "Omega")
```



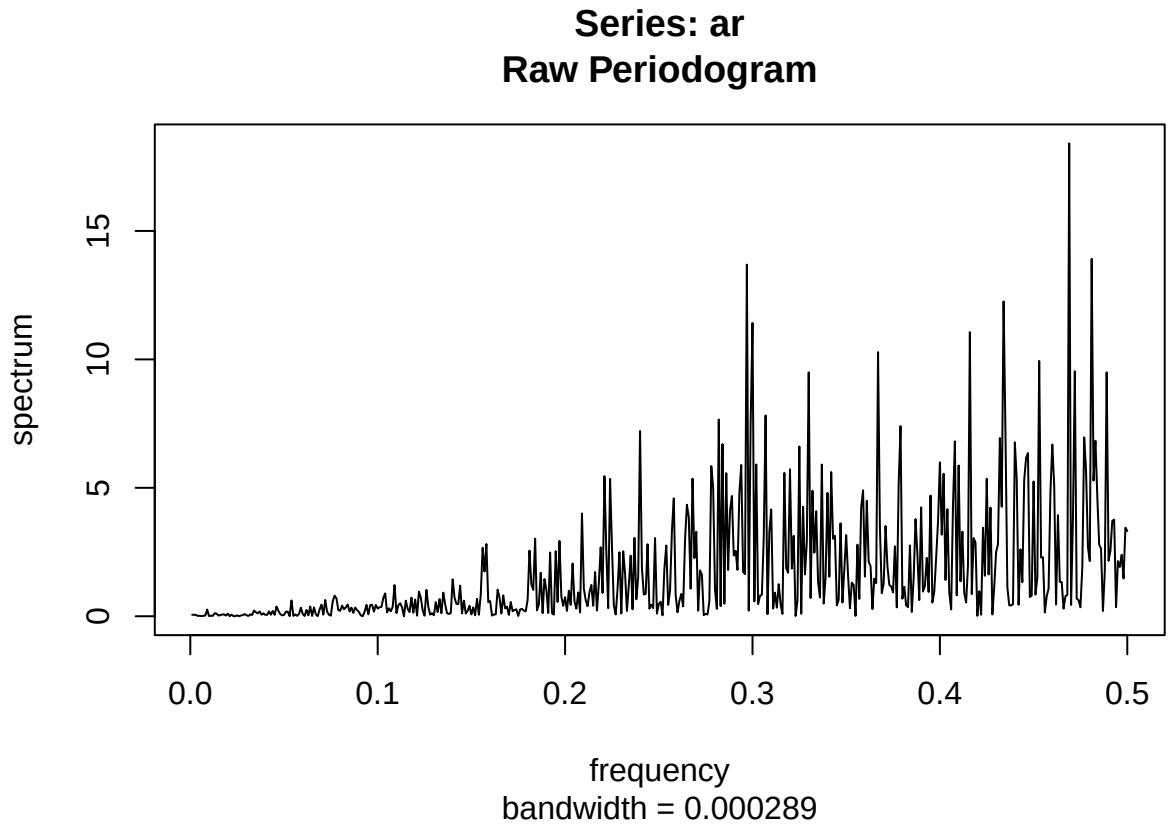
b)

```
ar <- arima.sim(n = 100, model = list(ar = c(-0.8)), sd = sqrt(1))
spec.pgram(ar, log = "no")
```



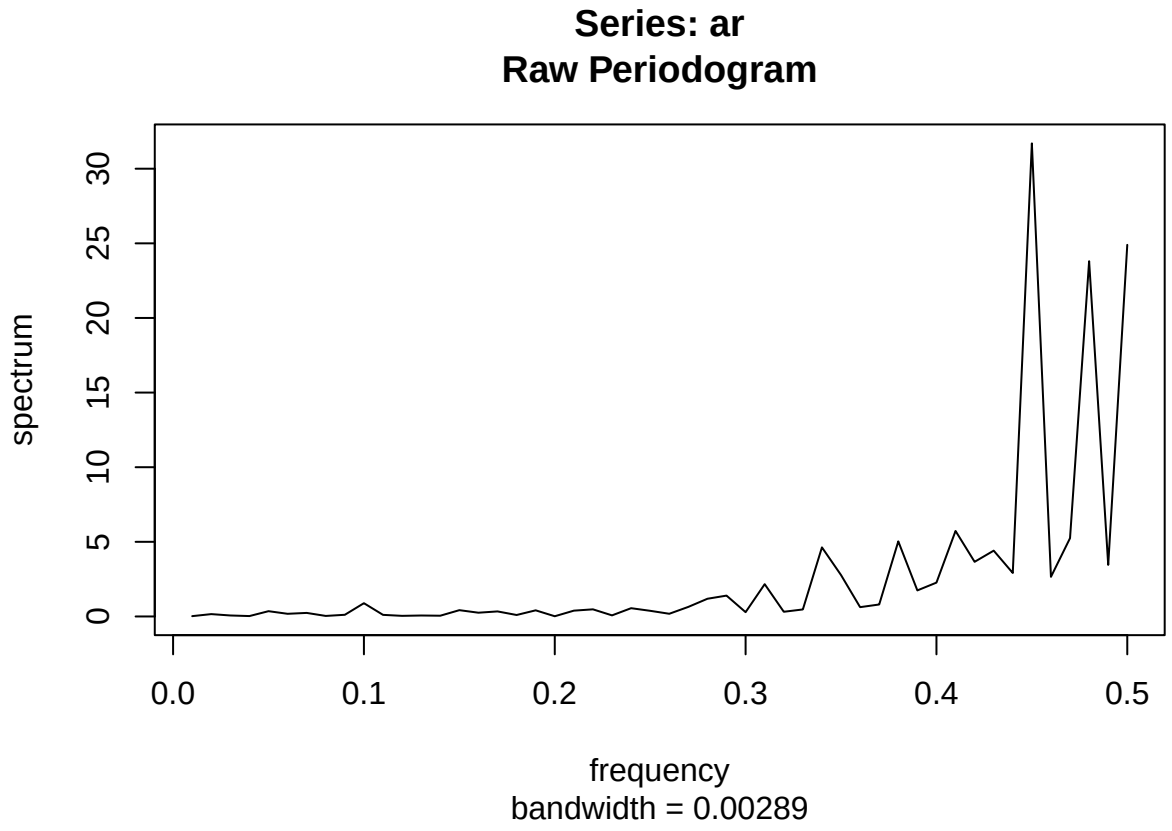
c)

```
ar <- arima.sim(n = 1000, model = list(ma = c(-0.8)), sd = sqrt(1))
spec.pgram(ar, log = "no")
```

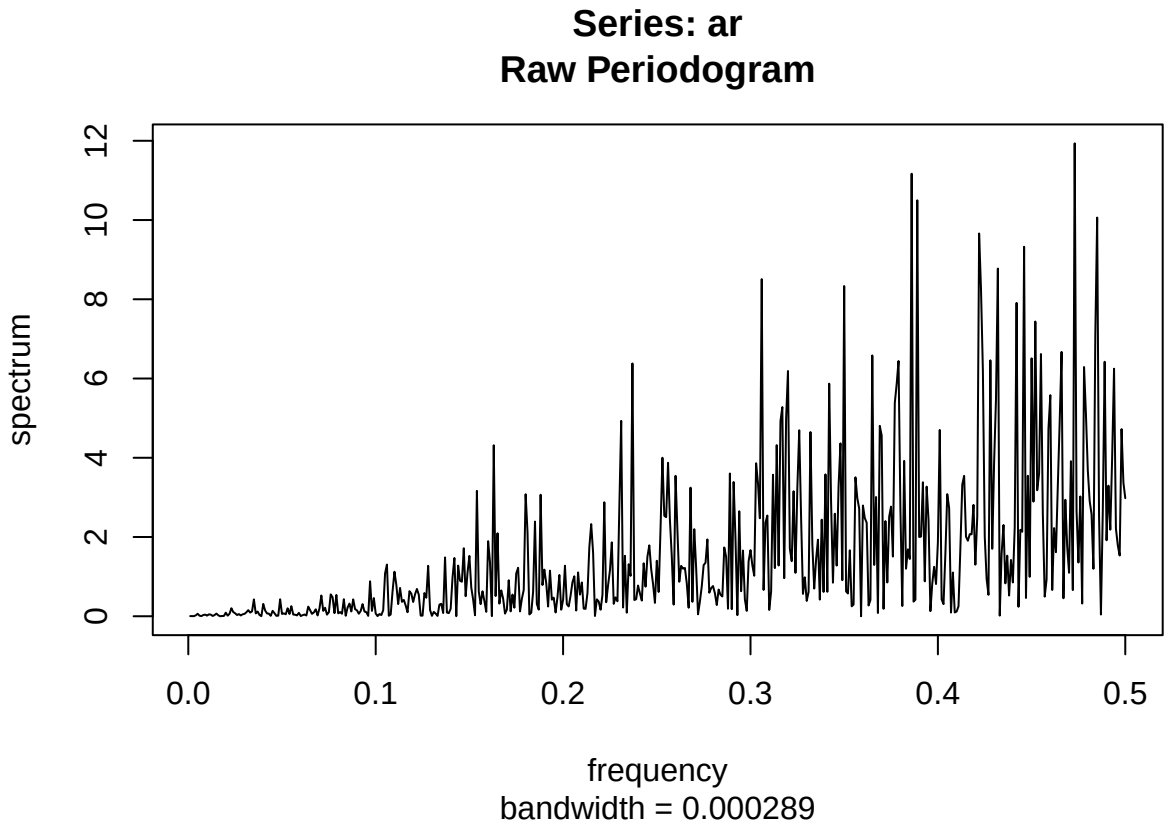


d)

```
ar <- arima.sim(n = 100, model = list(ar = c(-0.8)), sd = sqrt(1))
spec.pgram(ar, log = "no")
```




```r
ar <- arima.sim(n = 1000, model = list(ma = c(-0.8)), sd = sqrt(1))
spec.pgram(ar, log = "no")
```


Series: ar
Raw Periodogram
spectrum
0
2
4
6
8
10
12
0.0
0.1
0.2
0.3
0.4
0.5
frequency
bandwidth = 0.000289