Question 1

d)

First, we defined the matrix B:

```
B = matrix(c(1, -0.1, 0.2, 1), nrow=2,ncol=2, byrow = TRUE)
```

Then we calculated the inverse:

```
b2 = solve(B)
```

Created the matrix A_1:

```
A1= matrix(c(0.3, 0.3, 0.1, 0.4), nrow=2,ncol=2, byrow = TRUE)
```

In order to calculate the Impulse response functions for the first 30 steps, we used a loop function. In this case we used the "for" function.

For Yt:

```
irf_y= matrix(nrow=31, ncol=2, dimnames=list(c(paste("t=",0:30)),(c("E_yt","E_zt"))))
for (i in 1:31) {
 irf_y[i,1:2]=(A1^(i)%*%b2)[1,]
}
```

This code will give us the values of the impulse response functions ϕ_{11} and ϕ_{12}: the IRF of a shock from Yt in Yt and the IRF of a shock from Yt in Zt.

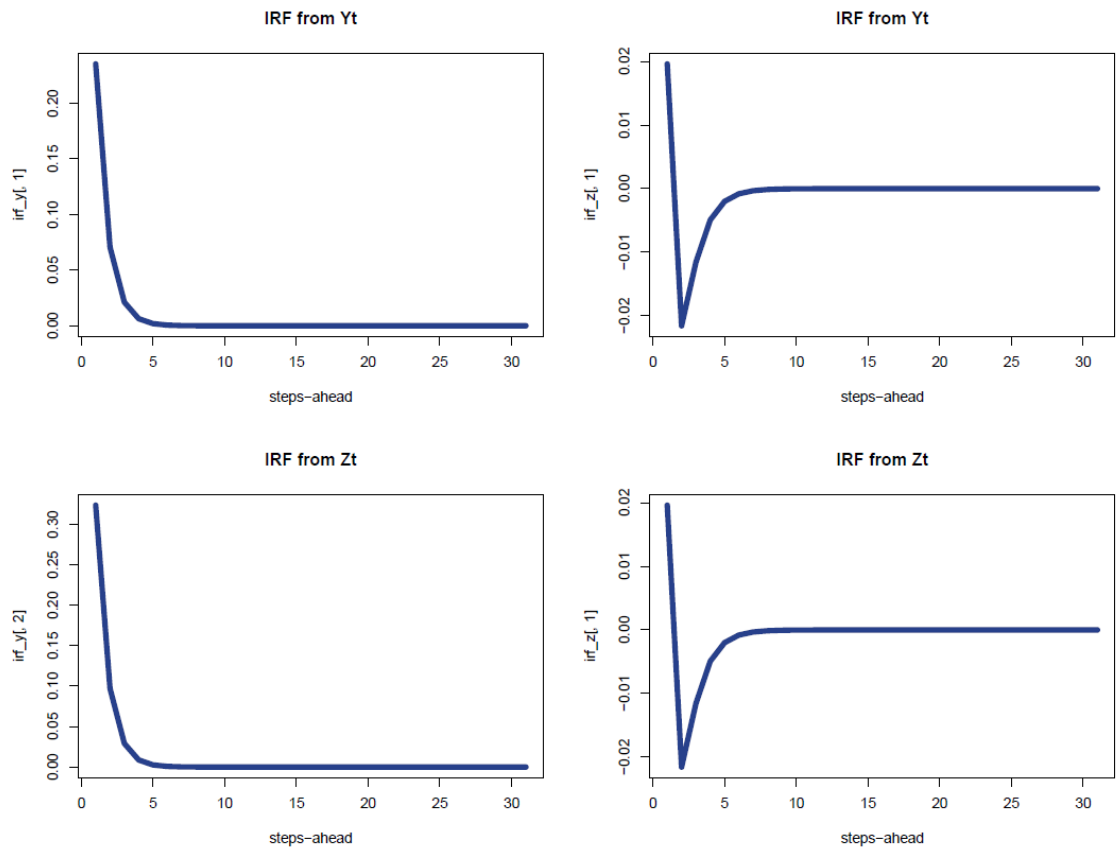
For Zt:

```
irf_z= matrix(nrow=31, ncol=2, dimnames=list(c(paste("t=",0:30)),(c("E_yt","E_zt"))))
for (i in 1:31) {
irf_z[i,1:2]=(A1^(i)%*%b2)[2,]
}
```

This code will give us the values of the impulse response functions ϕ_{21} and ϕ_{22}: the IRF of a shock from Yt in Zt and the IRF of a shock from Zt in Zt.

Now let's plot the IRFs:

```
par(mfrow=c(2,2))
plot(irf_y[,1], type="l", col="royalblue4", lwd=5, xlab="steps-ahead", main="IRF from Yt")
plot(irf_z[,1], type="l", col="royalblue4", lwd=5, xlab="steps-ahead", main="IRF from Yt")
plot(irf_y[,2], type="l", col="royalblue4", lwd=5, xlab="steps-ahead", main="IRF from Zt")
plot(irf_z[,1], type="l", col="royalblue4", lwd=5, xlab="steps-ahead", main="IRF from Zt")
```



The four impulse response functions converge to zero. Although, at the first steps, the initial shock Yt or Zt impacts the variables Yt or Zt, the impact shows a decay pattern. This is something that we were expecting, since we are dealing with stationary series. In these types of series, the impact of a shock that occurred in the first period will decay as time goes by, making the series convergent.