Ecology problem set 1

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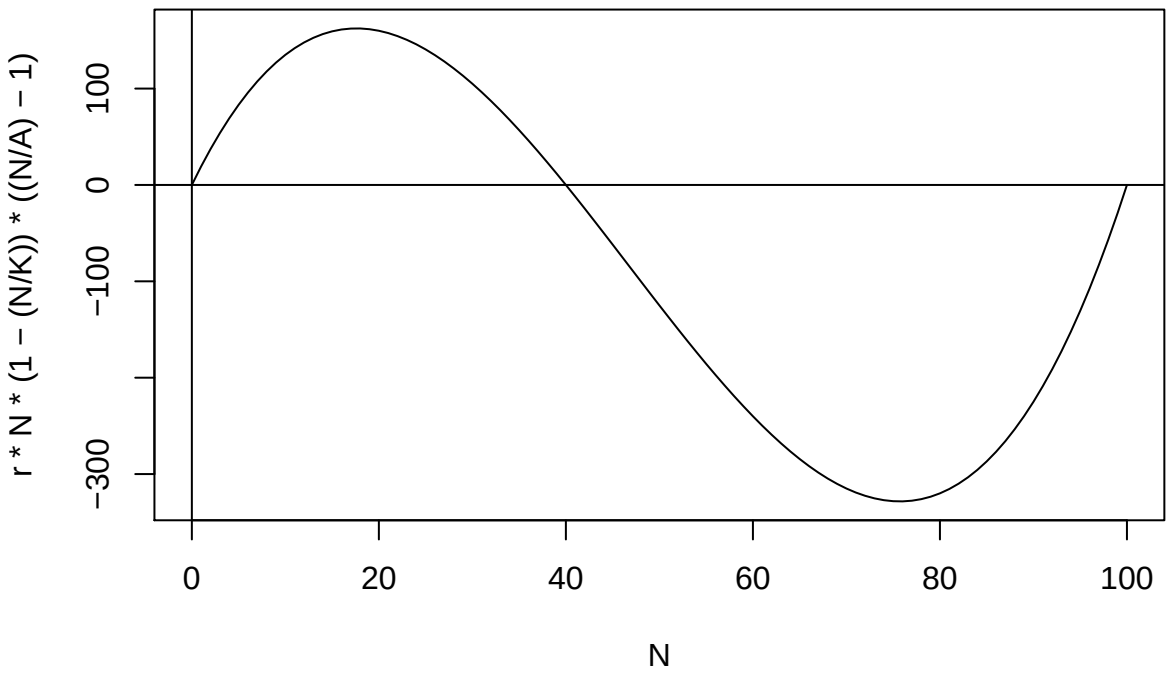
Exercise 1c - Allee effect in Logistic Density-dependence model

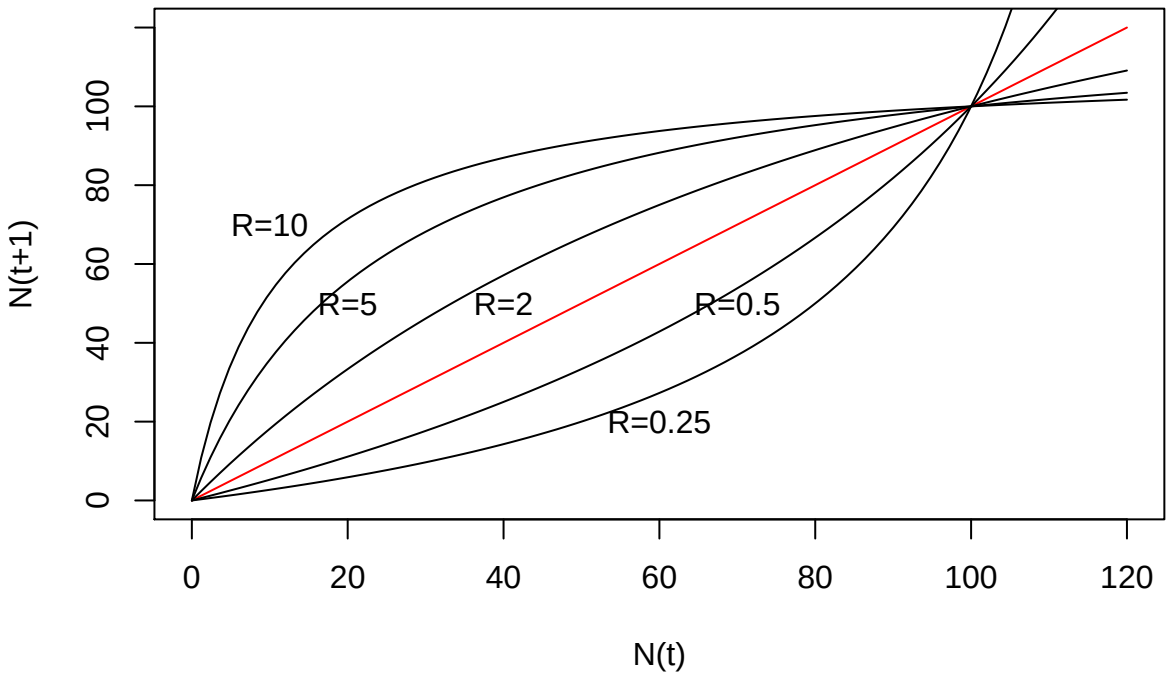
```
A <- 40
K <- 100
r <- -20

curve(r*N*(1-(N/K))*((N/A)-1), 0, 100, xname = "N")
abline(h = 0, v = 0)
```



Exercise 3c - Beverton-Holt model(N(t+1) vs N(t))

```
K <- 100
curve(1*N, 0, 120, xname = "N", xlab = "N(t)", ylab = "N(t+1)", col = "red")
x <- c(.25, .5, 2, 5, 10)
```

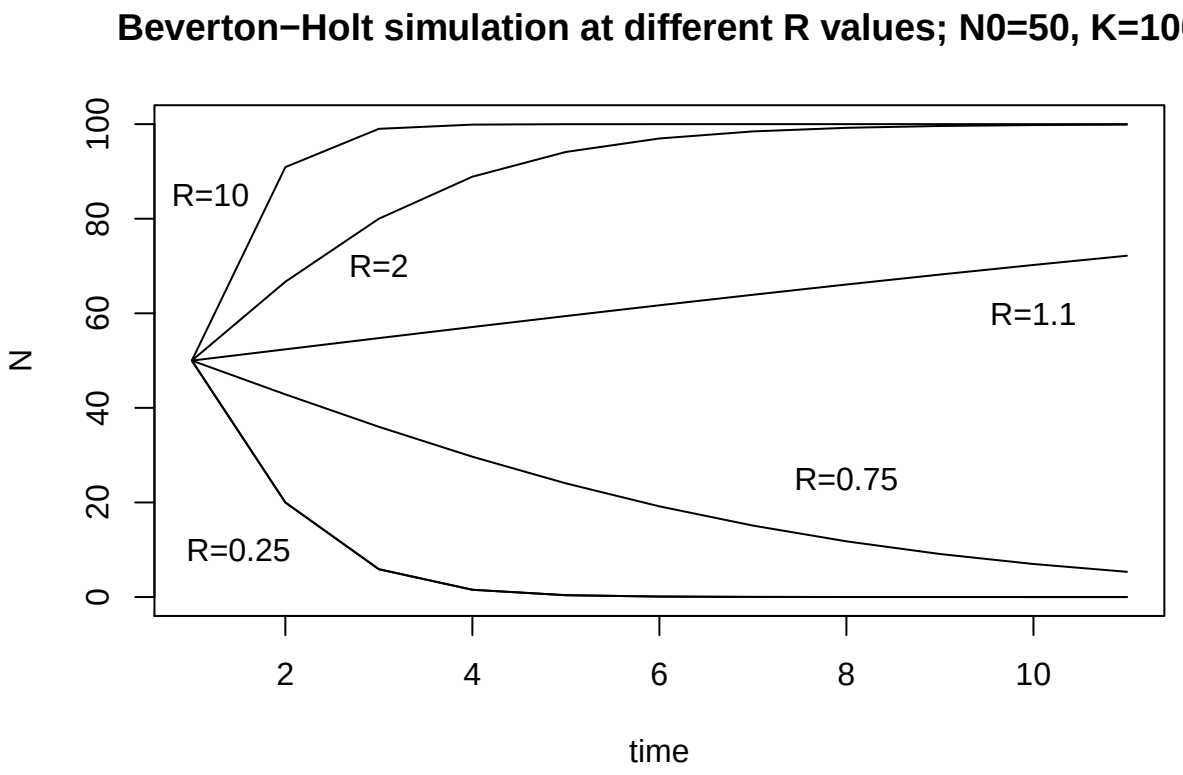
```
for(R in x){
  curve((R*N)/(1+((R-1)/K)*N), 0, 120, xname = "N", add = TRUE)
}
text(c(10, 20, 40, 70, 60), c(70, 50, 50, 50, 20), labels = c("R=10", "R=5", "R=2", "R=0.5", "R=0.25"))
```



Exercise 3d - Beverton-Holt model(N(t) vs time)

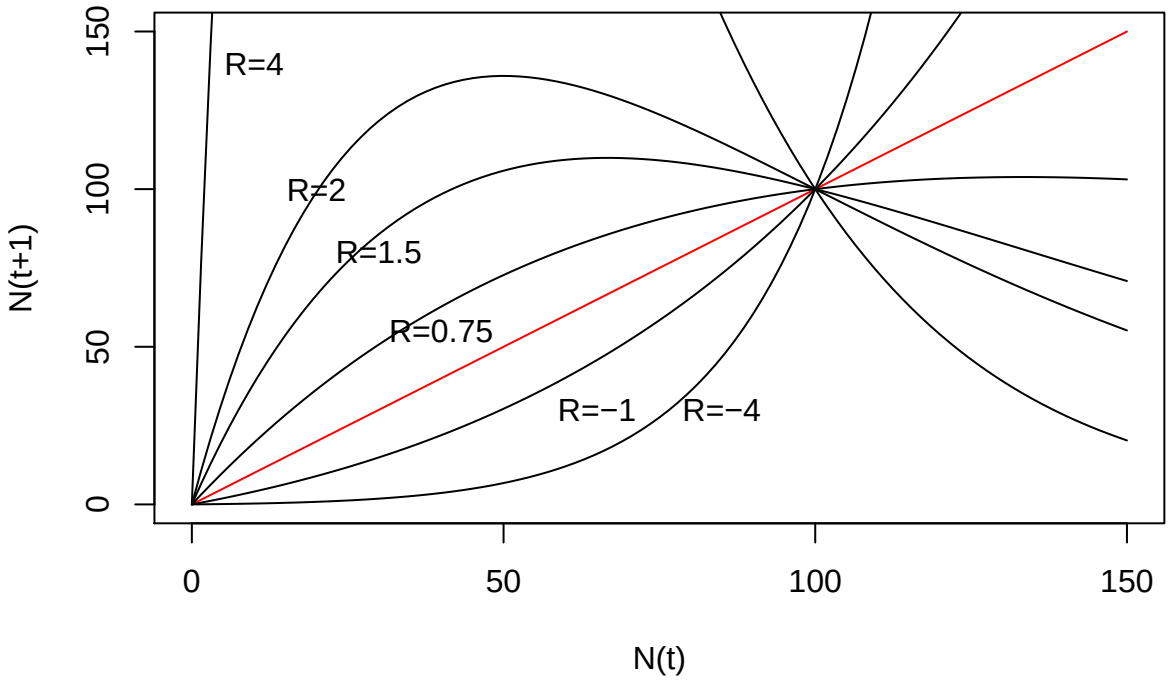
```
BevHoltFunc <- function(N0, RR, KK, ttmax=10){
  #initialize variable to a vector of NA values
  NN <- matrix(NA, nrow = 1, ncol = ttmax+1)
  NN[1] <- N0
  out.matrix <- matrix(NA, nrow = length(RR), ncol = ttmax +1)

  #use a loop to iterate the model the desired number of times
  for(ii in 1:length(RR)){
    for(tt in 1:ttmax){
      NN[tt+1] <- (RR[ii]*NN[tt])/(1+((RR[ii]-1)/KK)*NN[tt])
    }
    out.matrix[ii, ] <- NN
  }
  return(out.matrix)
}
```

```r
N0 <- 50
RR <- c(.25, .75, 1.1, 2, 10)
KK <- 100

output <- BevHoltFunc(N0, RR, KK)

plot(1:11, output[1, ], type = "l", main = "Beverton-Holt simulation at different R values; N0=50, K=100
for(ii in 1:length(RR)){
  lines(1:11, output[ii, ])
}
text(c(1.5, 8, 10, 3, 1.2), c(10, 25, 60, 70, 85), labels = c("R=0.25", "R=0.75", "R=1.1", "R=2", "R=10
```

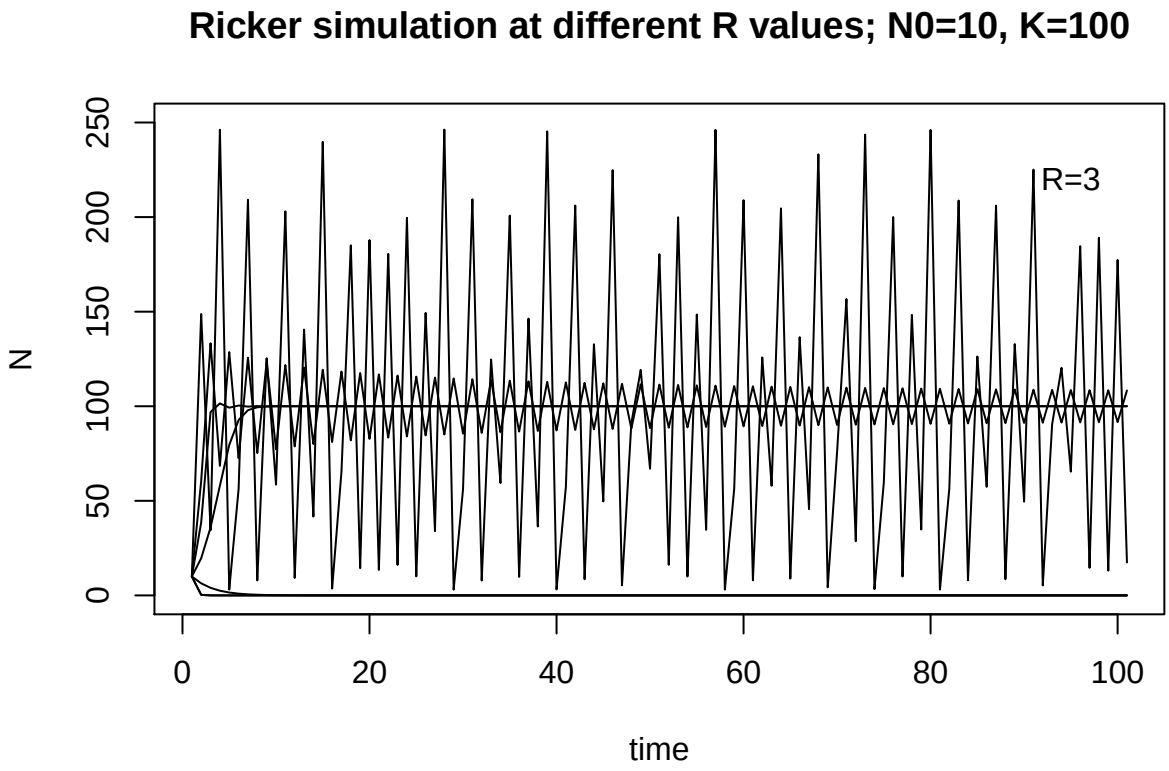


There is no chaotic regime in this model.

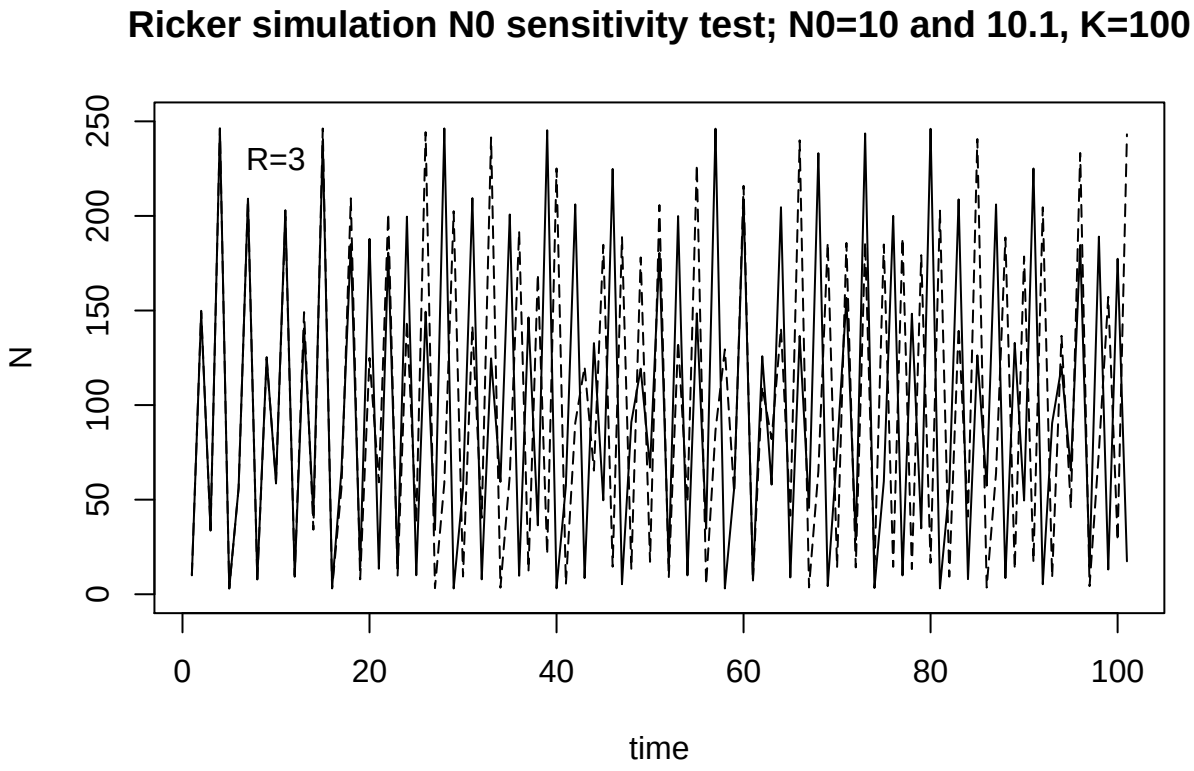
Exercise 3c - Ricker model(N(t+1) vs N(t))



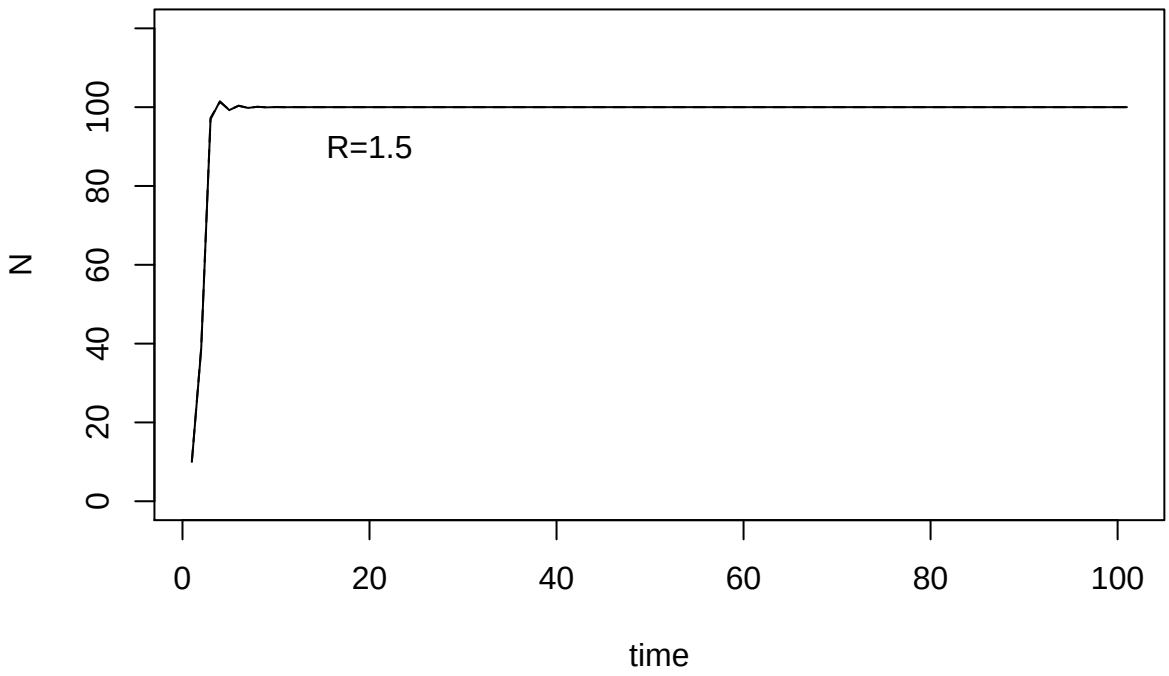
Exercise 3d - Ricker model(N(t) vs time)



Model enters chaotic regime at R>2.



Test sensitivity to N0.



Compare sensitivity to stable regime