BI 471 Exam 2

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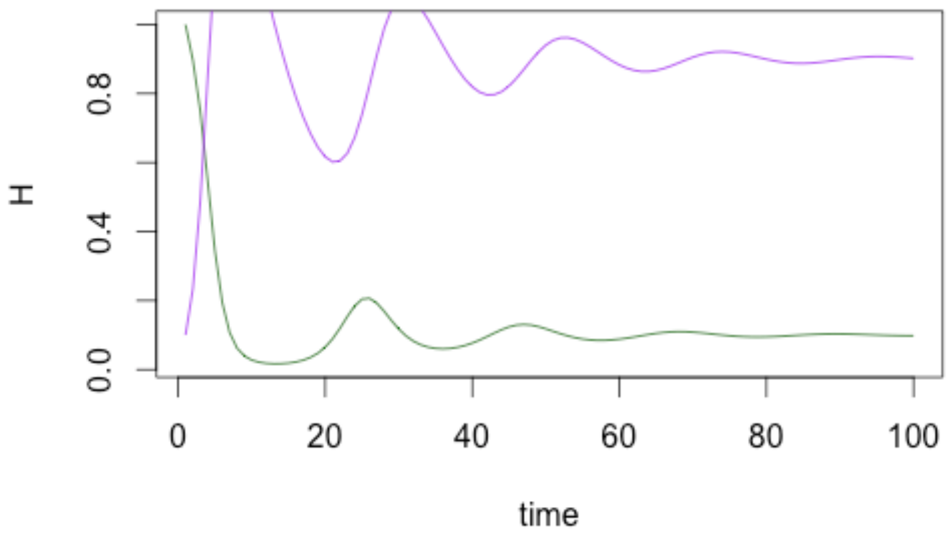
20 May 2016

1c)

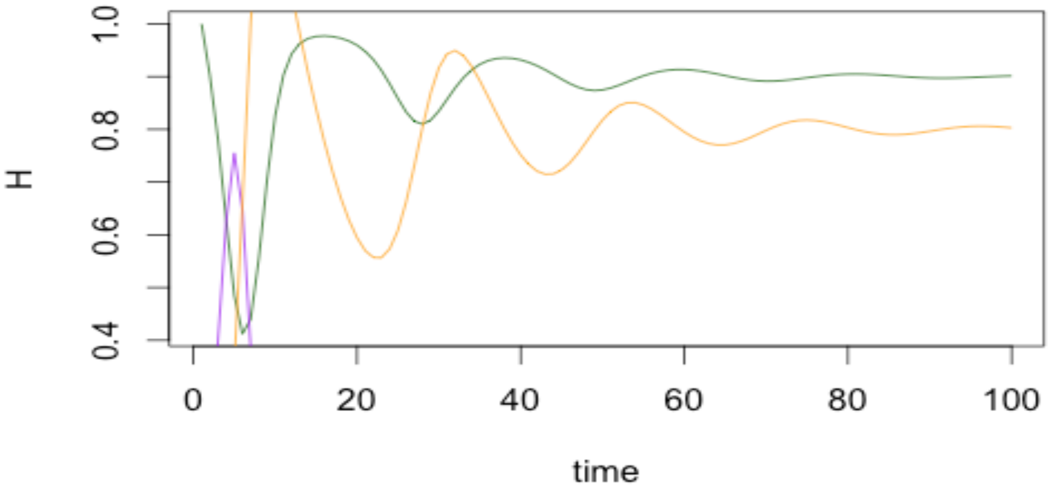
```
library(deSolve)

## write a function for competition
comp <- function(t, y, p) {
 H <- y[1]
 Z <- y[2]
 with(as.list(p), {
  dH.dt <- (r*H)*(1-(H/K)) - (b*H*Z)
  dZ.dt <- (c*H*Z) - (m*Z)
  return(list(c(dH.dt, dZ.dt)))
 })
}

## specify parameter values and initial conditions
p <- c('b' = 1, 'c' = 1, 'K' = 1, 'r' = 1, 'm' = 0.1)
y0 <- c('H' = 1, 'Z' = 0.1)
t <- 1:100

## simulations
sim <- ode(y = y0, times = t, func = comp, parms = p, method = 'lsoda')
sim <- as.data.frame(sim)

## plot time series
plot(H ~ time, data = sim, type = 'l', col = 'darkgreen')
points(Z ~ time, data = sim, type = 'l', col = 'purple')

plot(Z ~ H, data = sim, type = 'l', ylim = c(0, 5), bty = 'l', col="purple")
```



2)

```
library(deSolve)

## write a function for competition
comp <- function(t, y, p) {
  H <- y[1]
  Z <- y[2]
  P <- y[3]
  with(as.list(p), {
    dH.dt <- (r*H)*(1-(H/K)) - (b*H*Z)
    dZ.dt <- (c*H*Z) - (m*Z) - (d*Z*P)
    dP.dt <- (e*Z*P)-(n*P)
    return(list(c(dH.dt, dZ.dt, dP.dt)))
  })
}

## specify parameter values and initial conditions
p <- c('b' = 1, 'c' = 1, 'K' = 1, 'r' = 1, 'm' = 0.1, 'd' = 1, 'e' = 1, 'n' = 0.1)
y0 <- c('H' = 1, 'Z' = 0.1, 'P' = 0.1)
t <- 1:100

## simulations
sim <- ode(y = y0, times = t, func = comp, parms = p, method = 'lsoda')
sim <- as.data.frame(sim)
```

```
## plot time series
plot(H ~ time, data = sim, type = 'l', col = 'darkgreen')
points(Z ~ time, data = sim, type = 'l', col = 'purple')
points(P ~ time, data = sim, type = 'l', col = 'orange')

plot(Z ~ H, data = sim, type = 'l', ylim = c(0, 5), bty = 'l', col="purple")
```


H
time