HW10

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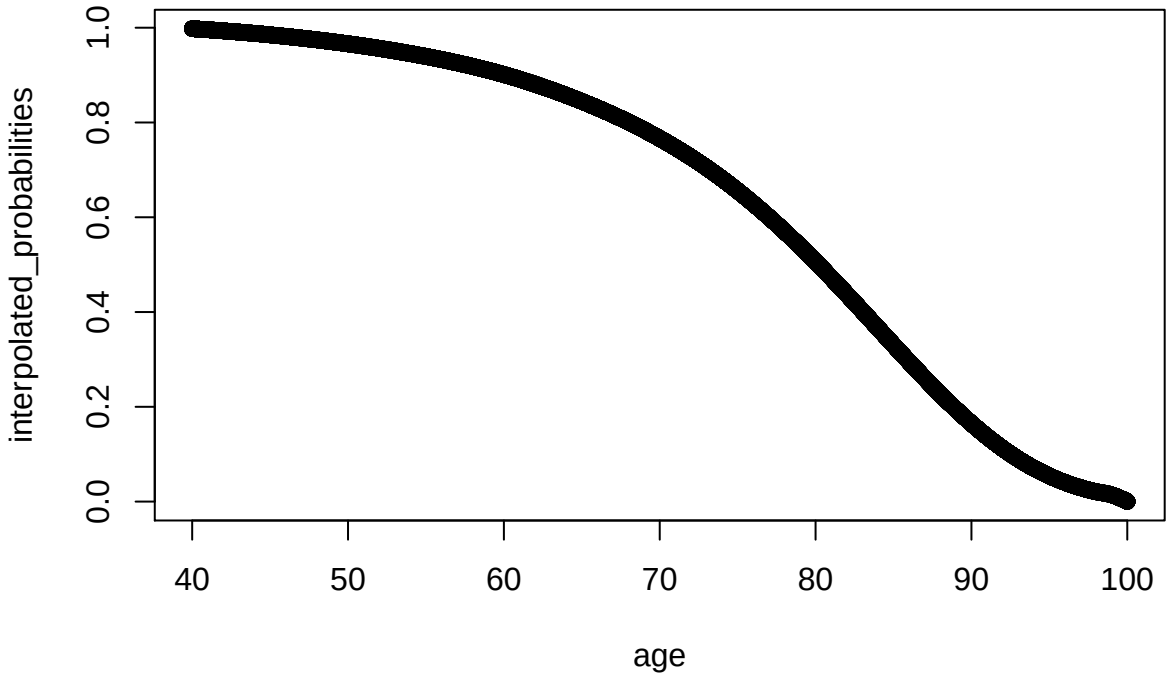
```
library(readxl)
US_Life_Expectancy_2003 <- read_excel("US Life Expectancy 2003.xls")
#View(US_Life_Expectancy_2003)

# new column with probability of not dying at age t
US_Life_Expectancy_2003$px <- 1 - US_Life_Expectancy_2003$qx
#View(US_Life_Expectancy_2003)
```

```
mult <- function(x, US_Life_Expectancy_2003){
  prod <- 1
  for (i in 41:x){
    prod <- prod*US_Life_Expectancy_2003$px[i]
  }
  return(prod)
}
```

```
# We want the probabilities the 40 - year old lives past 40, 41, 42, ..., 100.
# The 40 - year old has a probability of living past 40 if he/she does not die at 40,
# the 40 - year old has a probability of living past 41 if he/she does not die at 40,
# and at 41, etc.
# In general, the probability of living past 40+t is the product of the probabilities
# of not dying at 40, not dying at 41, not dying at 42, ..., not dying at 40+t.

N <- nrow(US_Life_Expectancy_2003)
US_Life_Expectancy_2003$probabilities <- NA

for (i in 41:N){
  US_Life_Expectancy_2003$probabilities[i] <- mult(i,US_Life_Expectancy_2003)
}

probabilities <- US_Life_Expectancy_2003$probabilities[41:N]
```

```
# cubic spline with t values (0,1,2,...,60) and
# corresponding probabilities of living past 40+t
spline <- splinefun(x=seq(0,length(probabilities)-1,1),
                    y=probabilities,
                    method = "natural")

# interpolate for other t values
interpolated_probabilities <- spline(seq(0, length(probabilities)-1, 0.001))
age <- 40 + seq(0, length(probabilities)-1, 0.001)

plot(x=age, y=interpolated_probabilities)
```


interpolated_probabilities
0.0
0.2
0.4
0.6
0.8
1.0
40
50
60
70
80
90
100
age