lab2_danhe178_rical803

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Uppgift 1 Likelihoodfunktioner

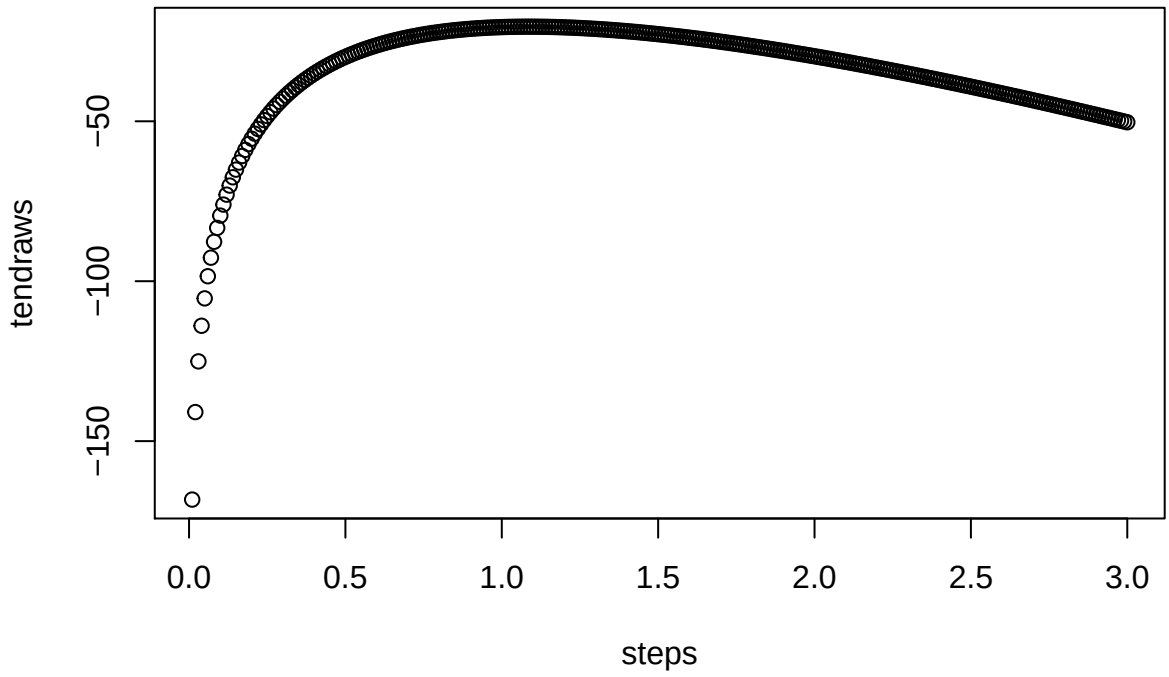
a)

```
llgamma <- function(x, alpha, beta) {
  return(length(x) * (alpha * log(beta) - lgamma(alpha)) + (alpha -1) * sum(log(x)) - beta * sum(x))
}
```

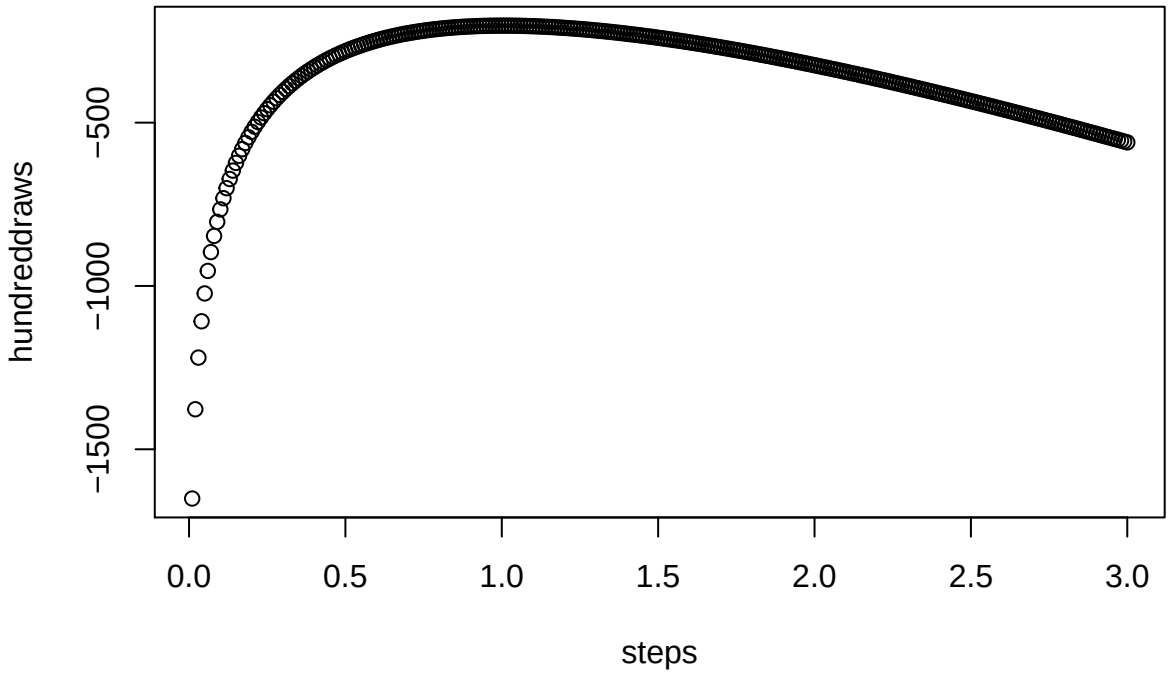
b)

```
x1 <- rgamma(n = 10, shape = 4, scale = 1)
x2 <- rgamma(n = 100, shape = 4, scale = 1)

tendraws <- c()
hundreddraws <- c()
steps <- c()

i = 0.01
while(i <= 3) {
  tendraws <- c(tendraws, llgamma(x1, alpha = 4, beta = i))
  hundreddraws <- c(hundreddraws, llgamma(x2, alpha = 4, beta = i))
  steps <- c(steps, i)
  i <- i + 0.01
}
```

```
# plot for ten draws
plot(steps, tendraws)
```




```
# plot for hundred draws
plot(steps, hundreddraws)
```




```
# Undersöker och returnerar vilket betavärde som loglikelyhoodfunktionen får sitt maxvärde på
findMaxIndex <- function(vect) {
  i <- NULL
  currentMax <- -Inf
  x <- 1
  while (x < length(vect)) {
    if (vect[x] > currentMax) {
```

```
      currentMax <- vect[x]
      i <- x
    }
    x <- x + 1
  }
  return(i/100)
}

findMaxIndex(tendraws)
```

```
## [1] 1.09
```

```
findMaxIndex(hundreddraws)
```

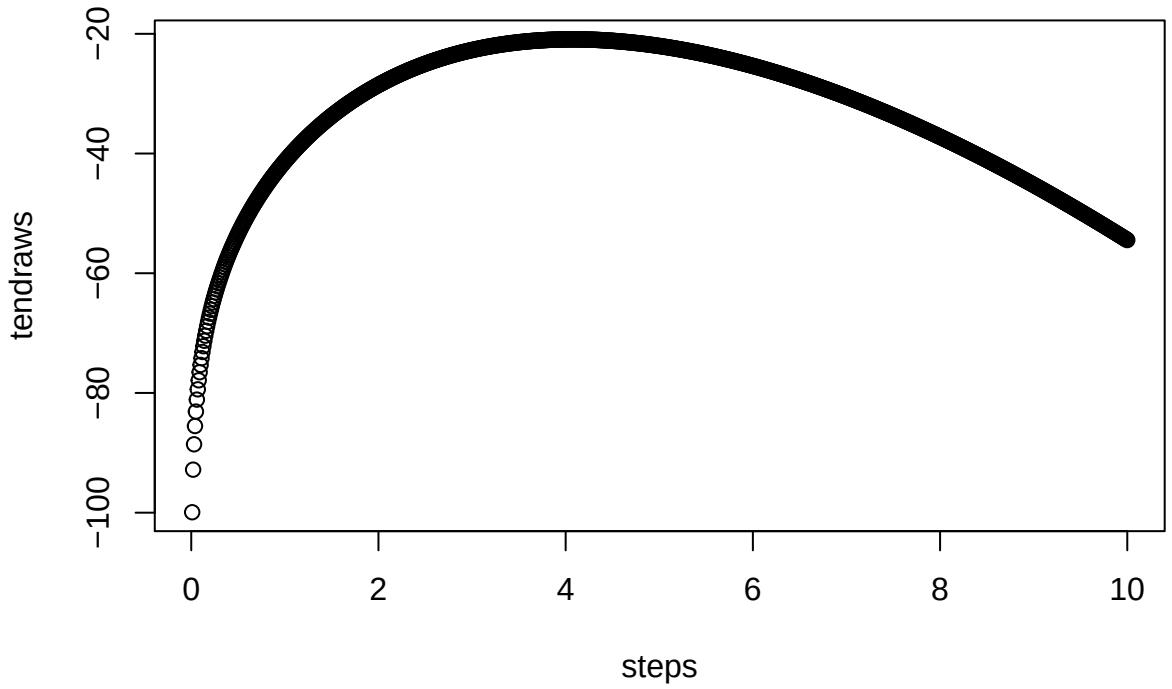
```
## [1] 1
```

Det varierar vilket av de upprepade värdena för beta som ger maximala värdet på loglikelihoodfunktionen, men ökar man antalet dragningar går denna siffra mot 1.0.

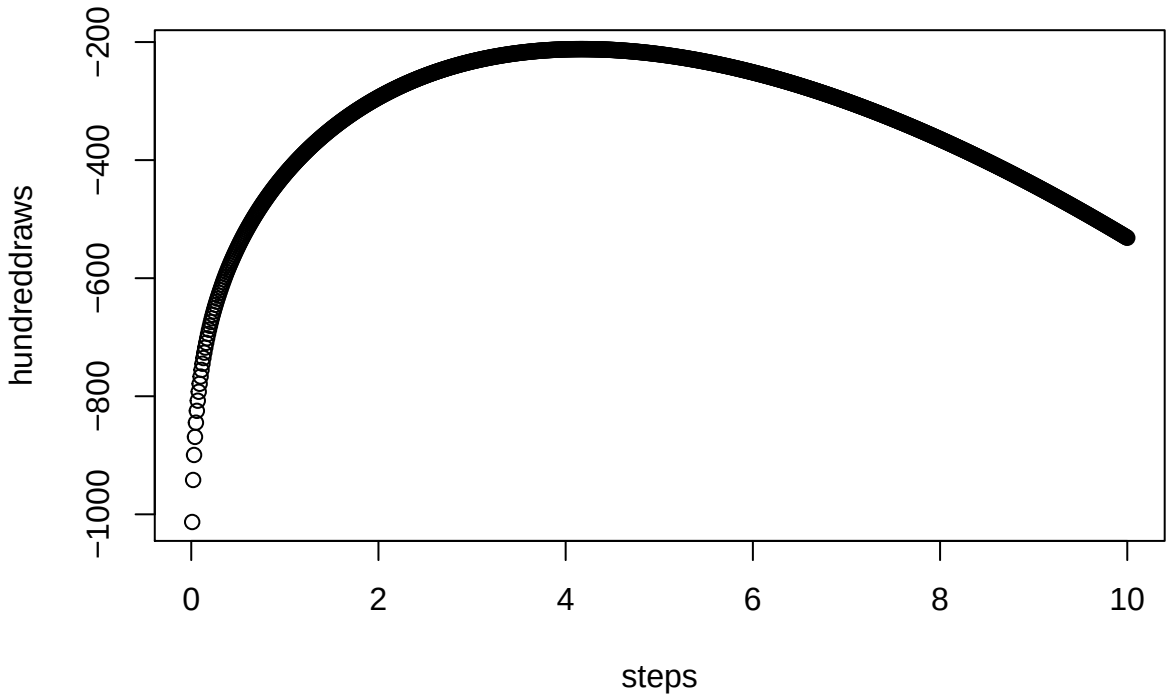
c)

```
x1 <- rgamma(n = 10, shape = 4, scale = 1)
x2 <- rgamma(n = 100, shape = 4, scale = 1)

tendraws <- c()
hundreddraws <- c()
steps <- c()

i = 0.01
while(i <= 10) {
  tendraws <- c(tendraws, llgamma(x1, alpha = i, beta = 1))
  hundreddraws <- c(hundreddraws, llgamma(x2, alpha = i, beta = 1))
  steps <- c(steps, i)
  i <- i + 0.01
}
```

```
# plot for ten draws
plot(steps, tendraws)
```




```
# plot for hundred draws
plot(steps, hundreddraws)
```




```
# Undersöker och returnerar vilket alphavärde som loglikelyhoodfunktionen får sitt maxvärde på
findMaxIndex <- function(vect) {
  i <- NULL
  currentMax <- -999999
  x <- 1
  while (x < length(vect)) {
```

```
    if (vect[x] > currentMax) {
      currentMax <- vect[x]
      i <- x
    }
    x <- x + 1
  }
  return(i/100)
}

findMaxIndex(tendraws)
```

```
## [1] 4.07
```

```
findMaxIndex(hundreddraws)
```

```
## [1] 4.17
```

Det varierar vilket av de upprepade värdena för alpha som ger maximala värdet på loglikelihoodfunktionen, men ökar man antalet dragningar går denna siffra mot 4.0.

c)