Homework 2

Gabriel Lahman

1/24/2019

Task 1

```
getParams = function(theta) {
  params = list(
    mu = theta[1],
    sigma = exp(theta[2])
  )

  return (params)
}

getTheta = function(params) {
  theta = rep(0,2)
  theta[1] = params$mu
  theta[2] = log(params$sigma)

  return (theta)
}
```

Task 2

```
logLikeParams = function(params, y) {
  n = length(y)
  s2 = (params$sigma)^ 2
  mu = params$mu
  logLike = (-n/2)*log(2*pi) -(n/2)*log(s2) - (1/(2*s2))*(sum((y-mu)^2))

  return (logLike)
}


logLikeTheta = function(theta, y) {
  params = getParams(theta)

  return (logLikeParams(params, y))
}
```

Task 3

```
MLE_norm = function(y, par_0, tol, maxit=10000) {
  par = getTheta(par_0)
  fn = logLikeTheta
  control = list(
    reltol=tol,
    fnscale=-1,
    maxit=maxit
  )
  opt = optim(
    par=par,
    fn=fn,
    y=y,
    control=control
  )

  MLE = list(
    mu = opt$par[1],
    sigma = opt$par[2]
  )

  log_lik = opt$value

  est = list(
    MLE=MLE,
    log_lik=log_lik
  )

  return (est)

}
```

Task 4

```
y = c(1,3,5,7,9)
par_0 = list(mu=5,
             sigma=2.828
             )
est = MLE_norm(y,
               par_0,
               .01
               )
```

```
## [1] "MLE Estimation for muHat = 5 and sigmaHat = 2.828"
```

```
## [1] "Mu= 5 Sigma= 1.03957 Log-Likelihood= -12.2933"
```