PC3a

1. R-script including the asked function:

```
stirling <- function(n){
   return(sqrt(2*pi*n)*(n/exp(1))^n)
}

for(i in 1:10){
   cat(sprintf("n=%2d  n!/Stirling's formula=%.8f\n", i,
factorial(i)/stirling(i)))
}
```

2. Output:
```
    a= 2.5  b= 5.5 c= 2   d= 3
```

question()	
a	$0 \rightarrow 2.5$
b	$1 \rightarrow 5.5$
c	2
d	3

method1()	
a	1
b	2
c	1/2
d	2
out	2.5

method2()	
a	2
b	1/2

method2()	
a	2.5
b	3

3. R-script including the asked function:

```r
times2<-function (x){
  k<-length(x)
  x2<-rep(0,k)
  carry<-0
  i<-k
  while(i>=1){
    tmp<-2*x[i]+carry
    carry<-0
    if(tmp>9){
      carry<-1
      x2[i]<-(tmp-10)
    } else {
      x2[i]<-tmp
    }
    i<-i-1
  }
  if(carry>0) {
    x2<-c(1,x2)
  }
  return(x2)
}

x=c(2)
for(i in 1:999){
  x<-times2(x)
}
sum(x)
```

4. R-script including the asked function:

```
approx2 <- function(x,b){
   g <- exp(2/b)-2*(x-b)/b^2*exp(2/b)+2*(1+b)*(x-
b)^2/b^4*exp(2/b)
}

b <- as.numeric(readline("Enter value for b: "))
x <- seq(2,4,0.1)
f <- exp(2/x)
g <- approx2(x,b)

library("ggplot2")
ggplot(mapping=aes(x=x)) +
   geom_point(aes(y=f),shape=16,size=4,col="red") +
   geom_line(aes(y=f),lty=2,size=1.5,col="red") +
   geom_point(aes(y=g),shape=17,size=4,col="cyan") +
   geom_line(aes(y=g),lty=2,size=1.5,col="cyan") +
   xlab("x") +
   ylab("") +
   labs(title = "f(x) and its 2nd order approximation")

MSE <- sum((f-g)^2)/length(x)
fbar <- sum(f)/length(f)
NRMSE <- sqrt(MSE)/fbar
cat(sprintf("NRMSE for the 2nd order approximation
is: %.7f\n",NRMSE))
cat(sprintf("%9.5f",x[1:6]))
cat(sprintf("\n"))
cat(sprintf("%9.5f",g[1:6]))
cat(sprintf("\n"))
```