

STAT 2450 Assignment 2

Alice Liu

Banner: B00783546

In the following exercises, use “for” loops to do your iteration.
(Do NOT use the built in function “sum”).

1. Use a “for” loop to evaluate the following sum, when $x=.5$.

$$y = \sum_{j=0}^{10} x^j$$

```
x=.5
y=0 # initialize y to 0
for (i in 0:10) {
  y = y + x^i
}
print(y)
```

```
## [1] 1.999023
```

Your answer should be 1.999023.

(5 points)

2. Use a for loop, and the built in function “sqrt”, to do the following:
loop over the elements of $x=c(16,-9,9,4,-1,0)$
if the element $x[i]$ is positive, print $x[i]$ and the square root of $x[i]$ or else if $x[i]$ is negative, print(“ $x[i]$ is negative”)

```
x=c(16,-9,9,4,-1,0)
for (i in x){
  if (i<0) { print("x[i] is negtive")
  } else
    {print (c(i,sqrt(i)))}
}
```

```
## [1] 16 4
## [1] "x[i] is negative"
## [1] 9 3
## [1] 4 2
## [1] "x[i] is negative"
## [1] 0 0
```

Your output should be equivalent to:

16 4

"x[i] is negative"

9 3

4 2

"x[i] is negative"

0 0

(5 points)

3. Use a "for" loop to iterate over the elements of a vector x, and increment a counter nodd when the element of x is odd. Then print the number of even and odd elements of x.

Recall that an integer y is odd if $y \% 2 == 1$, and otherwise y is even.

Use the R commands below to generate a vector "x" of length 100.

```
set.seed(10)
x=sample(1:10,100,replace=T)
x
```

```
## [1] 9 10 7 8 6 7 3 8 10 7 10 2 8 8 7 6 7 6 2 5 9 2 10 5 10
## [26] 1 7 10 2 9 4 2 8 3 6 2 1 10 10 1 9 9 8 5 10 9 1 7 8 2
## [51] 4 3 1 3 10 10 10 7 10 5 3 5 5 7 3 6 9 2 3 6 10 10 9 5 10
## [76] 10 2 9 4 4 3 7 1 4 6 9 3 9 9 1 6 10 7 9 8 9 4 3 3 3
```

Then modify the following code.

```
nodd=0 #initialize the counter nodd, which counts the number of odd elements of x
for(i in x){#for ( i in x ) {increment nodd in the loop when the associated element of x is odd}
  if(i%%2==1){
    nodd=nodd+1
  }
}
neven=length(x)-nodd #neven=calculate neven using the length of x and nodd.
paste("number of odd elements = ",nodd)
```

```
## [1] "number of odd elements = 51"
```

```
paste("number of even elements= ",neven)#paste("number of even elements = ",neven)
```

```
## [1] "number of even elements= 49"
```

For this vector x, the number of odd elements should be 56.

(5 points)

4. generate a random 5x5 matrix whose entries are the numbers 1,2, ... 25, but in random positions, using the following code:

```
set.seed(27) #set the seed for the random number generator
x=matrix(sample(1:25), byrow=T,ncol=5) #
x
```

```
##      [,1] [,2] [,3] [,4] [,5]
## [1,]    5   18   22    9    8
## [2,]   19   16    1   24   23
## [3,]   17   25    3   11   21
## [4,]   15   10    6    7    4
## [5,]   13   20   14   12    2
```

As you can see, on my system, I get the following input matrix:

It does not matter if you have a different matrix. Just use your matrix for the next exercise.

Then, using a pair of nested for loops, loop over the positions in the matrix x, and if the associated element of x is odd, replace the element by its negative.

```
#print(x)
for(i in 1:dim(x)[1]){#for loop involving i {
  for(j in 1:dim(x)[2]) {# for loop involving j {
    x[i,j]=ifelse(x[i,j]%%2==1, -x[i,j], x[i,j])#    x[i,j]=ifelse(x[i,j]%%2==1, -x[i,j], something
  }
}
print(x)#print(x)
```

```
##      [,1] [,2] [,3] [,4] [,5]
## [1,]   -5   18   22   -9    8
## [2,]  -19   16   -1   24  -23
## [3,]  -17  -25   -3  -11  -21
## [4,]  -15   10    6   -7    4
## [5,]  -13   20   14   12    2
```

Your answer should be equivalent to the following answer (which is valid for the input matrix shown above)

Use your own input matrix instead, if different.

(5 points)