

## R-Assignment 1

### Math 361

The purpose of this assignment is to become accustomed to the R. Go through the following bullets:

- Learn how to access help. Type  
> help.start()
- To assign a variable a value, use the command = or <-  
To set up a vector, named x, with the numbers 3 5 4 1, use the command,  
> x=c(3, 5, 4,1)  
and type  
> x  
to view the vector x.
- The vector c(3, 4, 5, 6) is the same as the vector 3:6,  
> 3:6
- To set up a vector with numbers 3.0 3.5 4.0 4.5 5.0 5.5 6.0, type  
> seq(3,6,0.5)
- To find the number of components of the vector x, type  
> length(x)  
and type  
> x[2]  
to select the second component.
- To find the sum of the components of the vector x, type  
> sum(x)  
and type  
> mean(x)  
to get the mean of x which is the same as  
> sum(x)/length(x)
- For the variance and standard deviation, type  
> var(x)  
> sd(x)
- Type  
> hist(x)  
to get the histogram
- The command  
> sort(x)  
gives the same vector as x, but sorted in increasing order.
- To repeat the vector x three times, i.e. 3541 3541 3541, type

```
> rep(x, time=3)
and to repeat each component three times, i.e. 333 555 444 111, type
> rep(x, each=3)
```

- Type

```
> f= function(x) x^2+1
for the function f with input x and output x^2+1. Type
> f(2)
to get the second component of f.
```

- The command

```
> objects()
display the names of the objects which are currently stored within R.
To remove the objects x and f, type
> rm(x,f)
```

- Type

```
> x= seq(-2,2, len=5)
for a vector x with 5 equally spaced values in the interval [-2,2]. Type
> y= seq(-3,3, len=4)
for a vector y with 4 equally spaced values in the interval [-3,3].
```

Then type

```
> f= outer(x,y, function(x,y) x^2+y)
where f is a 5 by 4 matrix with rows and columns indexed by x and y respectively, of values of
the function  $x^2+y$ .
```

- Simulate 50 tosses of a fair coin. Type

```
> x=rbinom(50, 1, 0.5)
and view the result
> x
Now add the total number of heads by typing
> t=cumsum(x)
Plot the result with steps (type='s')
> plot(t, type='s')
Type
> data.frame(x,t)
to display x and t in a table.
```

- Now use the sample command to simulate 50 coin tosses. Type

```
x=c(0,1)
data=sample(x,50,replace = T)
sum(data)
```

- Plot a parametrized curve and start with the sequences x and y. Type

```
> theta=seq(-pi, pi, 0.01)
> x=sin(5*theta)
```

```
> y= cos(7*theta)
```

```
> plot(x,y, type="l",xlab="x",ylab="y")
```

The (type="l") is the letter l which connects the values in the sequence with lines.

The (xlab="x") and (ylab="y") label the x-axis and y-axis.

- We will now look at a surface plot. Define a function f that depends on x and y.

```
> f=function(x,y) (sin(x)+sin(3*y))/(1+x^2+y^2)
```

where x and y take the values,

```
> x=seq(-2,2,.1);
```

```
> y=seq(-2,2,.1);
```

Type

```
> z=outer(x,y,f)
```

where z is a square matrix with rows and columns indexed by x and y respectively, of values of the function f. Now draw a surface plot.

```
> persp(x=x,y=y,z=z, col="blue")
```

Change the viewing angle

```
> persp(x=x,y=y,z=z, theta=10,phi=40, col="blue")
```

Plot the density

```
> ncolors =30
```

```
> col= terrain.colors (ncolors)
```

```
> persp(x=x,y=y,z=z, theta=10,phi=40, col=col)
```