Experiment 5 **Mannat** **102017172**

1. Consider that X is the time (in minutes) that a person has to wait in order to take a flight. If each flight takes off each hour X ~ U(0, 60). Find the probability that

   (a) waiting time is more than 45 minutes, and
   (b) waiting time lies between 20 and 30 minutes.

CODE :-

```
#ques-1
#p(x > 45), so lower.tail = FALSE
punif(45,0,60,lower.tail = FALSE)
#p(x < 30), so lower.tail = TRUE
punif(30,0,60,lower.tail = TRUE) - punif(20,0,60,lower.tail = TRUE)
```

OUTPUT :-

```
> punif(45,0,60,lower.tail = FALSE)
[1] 0.25
> #p(x < 30), so lower.tail = TRUE
> punif(30,0,60,lower.tail = TRUE) - punif(20,0,60,lower.tail = TRUE)
[1] 0.1666667
```

2. The time (in hours) required to repair a machine is an exponential distributed random variable with parameter $\lambda = 1/2$.

   (a) Find the value of density function at x = 3.
   (b) Plot the graph of exponential probability distribution for $0 \leq x \leq 5$.
   (c) Find the probability that a repair time takes at most 3 hours.
   (d) Plot the graph of cumulative exponential probabilities for $0 \leq x \leq 5$.
   (e) Simulate 1000 exponential distributed random numbers with $\lambda = ½$ and plot the simulated data.

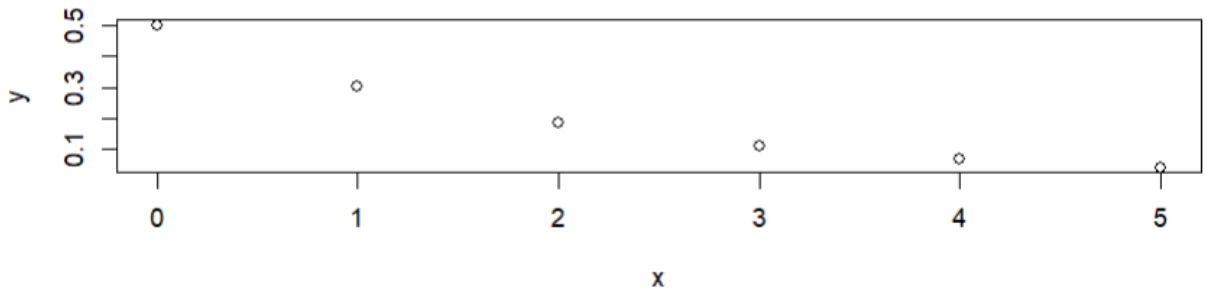
CODE :-

```
#ques-2
#a
dexp(3,1/2)

#b
x <- 0:5
y <- dexp(x,1/2) #for pdf
plot(x,y)
```

```
> dexp(3,1/2)
[1] 0.1115651
> x <- 0:5
> y <- dexp(x,1/2) #for pdf
> plot(x,y)
>
```

Plot :-



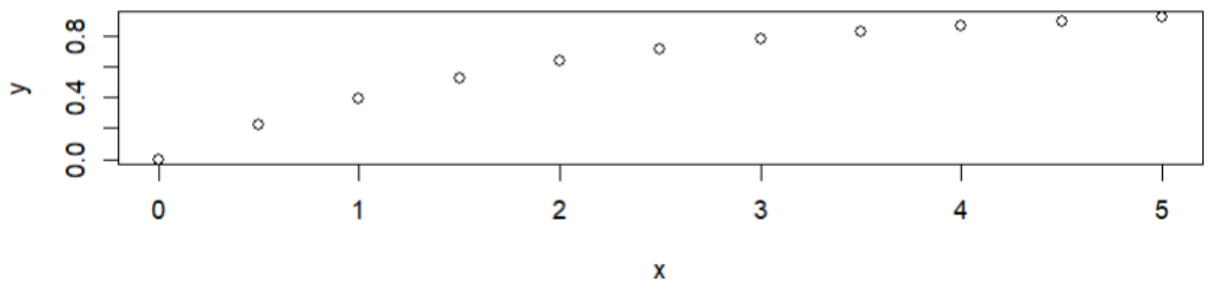
Code :

```
#c
pexp(3,1/2)

#d
x <- seq(0,5, by=0.5)
y <- pexp(x,1/2) #for cdf
plot(x,y)
```

```
> #c
> pexp(3,1/2)
[1] 0.7768698
>
> #d
> x <- seq(0,5, by=0.5)
> y <- pexp(x,1/2) #for cdf
> plot(x,y)
>
```

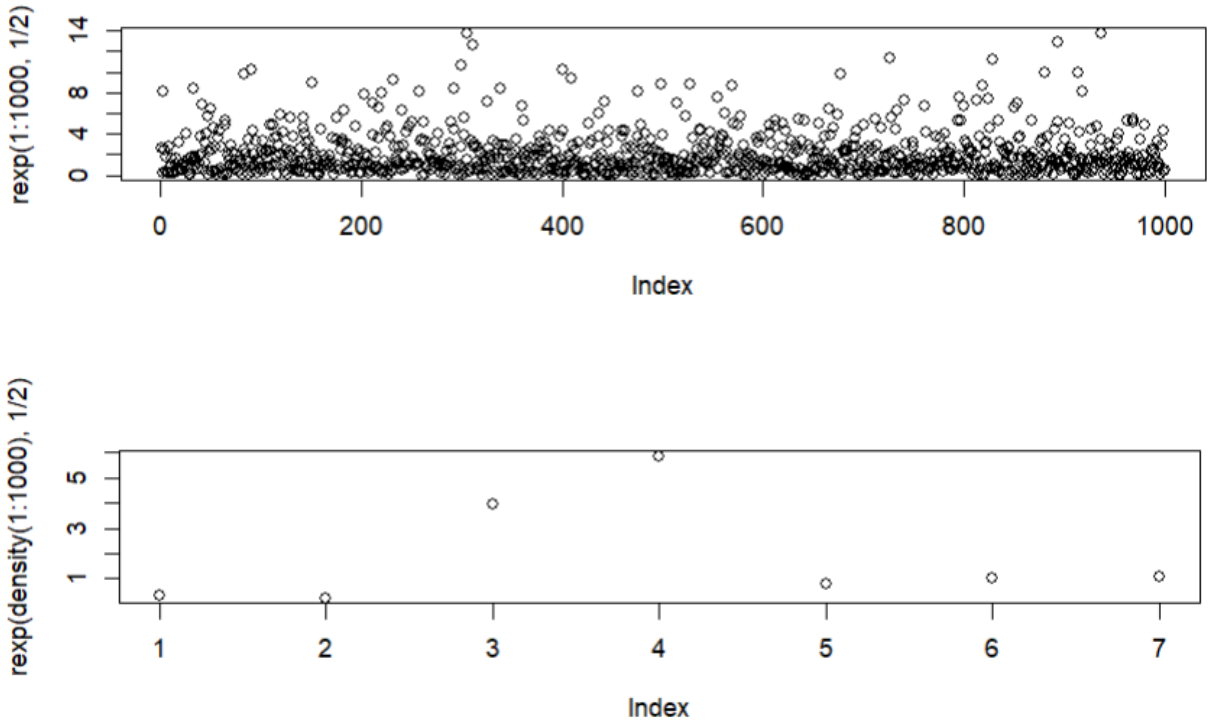
Plot :-



Code :-

```
#e
plot(rexp(1:1000,1/2))
plot(rexp(density(1:1000),1/2))
```

Plot :-



3. The lifetime of certain equipment is described by a random variable X that follows Gamma distribution with parameters $\alpha = 2$ and $\beta = 1/3$.
   (a) Find the probability that the lifetime of equipment is (i) 3 units of time, and (ii) at least 1 unit of time.
   (b) What is the value of c, if $P(X \leq c) \geq 0.70$? (**Hint:** try quantile function qgamma())

Code :-

```
#ques-3
dgamma(3,shape = 2, scale = 1/3)
pgamma(1,shape = 2, scale = 1/3, lower.tail = FALSE)
qgamma(0.7, shape = 2, scale = 1/3)
```

Output :-

```
> #ques-3
> dgamma(3,shape = 2, scale = 1/3)
[1] 0.003332065
> pgamma(1,shape = 2, scale = 1/3, lower.tail = FALSE)
[1] 0.1991483
> qgamma(0.7, shape = 2, scale = 1/3)
[1] 0.8130722
```