R STUDIO – EXERCISE 6

AIM: To compute the probabilities and cumulative probabilities of a Poisson distribution.

QUESTION 1

Compute Probabilities and cumulative probabilities of the values between 0 and 10 for the parameter 2 in Poisson distribution.

```
> dpois(0:10,2)
[1] 1.353353e-01 2.706706e-01 2.706706e-01 1.804470e-01 9.022352e-02
 [6] 3.608941e-02 1.202980e-02 3.437087e-03 8.592716e-04 1.909493e-04
[11] 3.818985e-05
```

```
> ppois(0:10,2) //Cumulative
[1] 0.1353353 0.4060058 0.6766764 0.8571235 0.9473470 0.9834364
 [7] 0.9954662 0.9989033 0.9997626 0.9999535 0.9999917
```

QUESTION 2

If there are twelve cars crossing a bridge per minute on average, find the probability of having seventeen or more cars crossing the bridge in a particular minute.

```
> ppois(16,lambda = 12,lower=FALSE)
[1] 0.101291
```

```
> x=c(44,49,52,54,47,76,65,60,63,58,50,67)
> y=c(48,55,45,60,43,80,58,50,77,46,47,65)
> cor(x,y)
[1] 0.7804552
```

QUESTION 3

Poisson distribution with parameter 2

a. How to obtain a sequence from 0 to 10

b. Calculate P(0), P(1), ..., P(10) when lambda = 2 and Make the output prettier

c. Find P(X<=6)

d. Sum all probabilities

e. Find P(X>6)

f. Make a table of the first 11 Poisson probabilities and cumulative probabilities when # lambda=2 and make the output prettier

g. Plot the probabilities Put some labels on the axes and give the plot a title

(a)

```
> x=0:10
> x
[1]  0  1  2  3  4  5  6  7  8  9 10
```

(b)

```
> d=dpois(0:10,lambda = 2 )
> round(d,4)
 [1] 0.1353 0.2707 0.2707 0.1804 0.0902 0.0361 0.0120 0.0034 0.0009
[10] 0.0002 0.0000
```

(c)

```
> ppois(6,2)
[1] 0.9954662
```

(d)

```
> ppois(6,lambda = 2,lower.tail = T)
[1] 0.9954662
```

(e)

```
> ppois(6,lambda = 2,lower.tail = F)
[1] 0.004533806
```

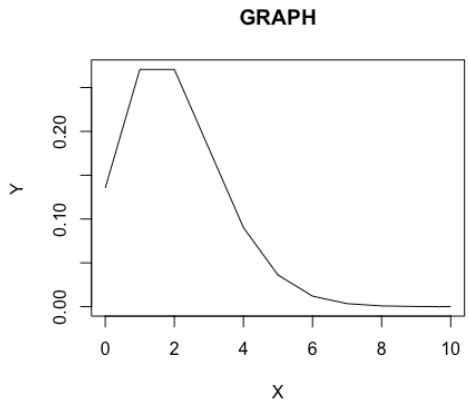
(f)

```
> d=dpois(0:11, 2)
> p=ppois(0:11, 2)
> round(data.frame(d, p), 4)
1 0.1353 0.1353
2 0.2707 0.4060
3 0.2707 0.6767
4 0.1804 0.8571
5 0.0902 0.9473
6 0.0361 0.9834
7 0.0120 0.9955
```

```
8  0.0034  0.9989
9  0.0009  0.9998
10 0.0002  1.0000
11 0.0000  1.0000
12 0.0000  1.0000
```

(g)

```
>plot(0:10, dpois(0:10,2),type="l",xlab="X",ylab="Y",main="GRAPH")
```



QUESTION 4

Let X denote the no of grams of hydrocarbons emitted by an automobile per mile. Assuming X is normal with μ=1 grams and σ=0.25, find the probability that a randomly selected automobile will emit b/w 0.9 and 1.54 gm of hydrocarbons per mile.

```
>pnorm(x,mean=1,sd=0.25)
[1] 0.3445783
> pnorm(0.9,mean=1,sd=0.25)
[1] 0.3445783
> pnorm(1.54,mean=1,sd=0.25)
[1] 0.9846137
> y1=pnorm(0.9,mean=1,sd=0.25)
> y2=pnorm(1.54,mean=1,sd=0.25)
> y=y2-y1
> y
[1] 0.6400354
```

QUESTION 5

A certain type of storage battery lasts on the average 3.0 years with standard deviation of 0.5 year. Assuming that the battery lives are normally distributed, find the probability that a given battery will last less than 2.3 years.

```
> pnorm(2.3,mean=3,sd=0.5)
[1] 0.08075666
```

QUESTION 6

To create a sequence of 100 numbers with x=-5 to 5 for standard normal pdf with mean 0 and sd =1.

a) Plot x and its probabilities

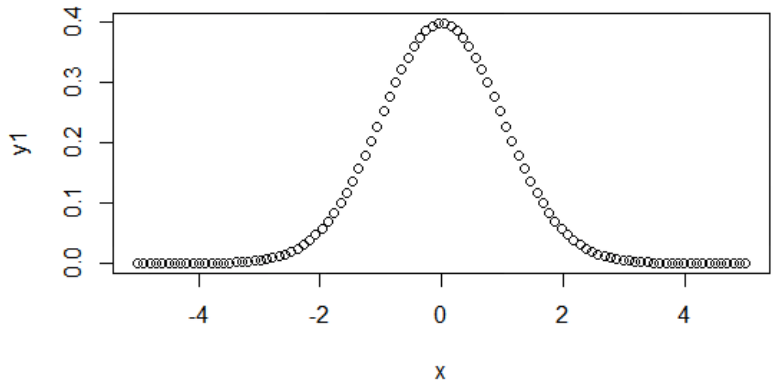
b) Plot x and cumulative probabilities

```
> x=seq(-5,5,length.out=100)
> x
  [1] -5.00000000 -4.89898990 -4.79797980
  [4] -4.69696970 -4.59595960 -4.49494949
  [7] -4.39393939 -4.29292929 -4.19191919
 [10] -4.09090909 -3.98989899 -3.88888889
 [13] -3.78787879 -3.68686869 -3.58585859
 [16] -3.48484848 -3.38383838 -3.28282828
 [19] -3.18181818 -3.08080808 -2.97979798
 [22] -2.87878788 -2.77777778 -2.67676768
 [25] -2.57575758 -2.47474747 -2.37373737
 [28] -2.27272727 -2.17171717 -2.07070707
 [31] -1.96969697 -1.86868687 -1.76767677
 [34] -1.66666667 -1.56565657 -1.46464646
 [37] -1.36363636 -1.26262626 -1.16161616
 [40] -1.06060606 -0.95959596 -0.85858586
 [43] -0.75757576 -0.65656566 -0.55555556
 [46] -0.45454545 -0.35353535 -0.25252525
 [49] -0.15151515 -0.05050505 0.05050505
 [52] 0.15151515 0.25252525 0.35353535
 [55] 0.45454545 0.55555556 0.65656566
 [58] 0.75757576 0.85858586 0.95959596
 [61] 1.06060606 1.16161616 1.26262626
 [64] 1.36363636 1.46464646 1.56565657
 [67] 1.66666667 1.76767677 1.86868687
```

```
 [70] 1.96969697 2.07070707 2.17171717
 [73] 2.27272727 2.37373737 2.47474747
 [76] 2.57575758 2.67676768 2.77777778
 [79] 2.87878788 2.97979798 3.08080808
 [82] 3.18181818 3.28282828 3.38383838
 [85] 3.48484848 3.58585859 3.68686869
 [88] 3.78787879 3.88888889 3.98989899
 [91] 4.09090909 4.19191919 4.29292929
 [94] 4.39393939 4.49494949 4.59595960
 [97] 4.69696970 4.79797980 4.89898990
 [100] 5.00000000
```

```
> y1=dnorm(x, mean=0, sd=1)
> y1
[1] 1.486720e-06 2.451061e-06
[3] 3.999890e-06 6.461166e-06
[5] 1.033101e-05 1.635096e-05
[7] 2.561608e-05 3.972382e-05
[9] 6.097590e-05 9.264764e-05
[11] 1.393411e-04 2.074403e-04
[13] 3.056862e-04 4.458897e-04
[15] 6.437955e-04 9.201048e-04
[17] 1.301654e-03 1.822731e-03
[19] 2.526496e-03 3.466438e-03
[21] 4.707791e-03 6.328776e-03
[23] 8.421534e-03 1.109255e-02
[25] 1.446241e-02 1.866461e-02
[27] 2.384327e-02 3.014961e-02
[29] 3.773692e-02 4.675414e-02
[31] 5.733801e-02 6.960396e-02
[33] 8.363618e-02 9.947714e-02
[35] 1.171174e-01 1.364860e-01
[37] 1.574432e-01 1.797747e-01
[39] 2.031898e-01 2.273235e-01
[41] 2.517419e-01 2.759534e-01
[43] 2.994227e-01 3.215900e-01
[45] 3.418923e-01 3.597866e-01
[47] 3.747740e-01 3.864229e-01
[49] 3.943892e-01 3.984338e-01
[51] 3.984338e-01 3.943892e-01
[53] 3.864229e-01 3.747740e-01
[55] 3.597866e-01 3.418923e-01
[57] 3.215900e-01 2.994227e-01
[59] 2.759534e-01 2.517419e-01
[61] 2.273235e-01 2.031898e-01
```

```
 [63] 1.797747e-01 1.574432e-01
 [65] 1.364860e-01 1.171174e-01
 [67] 9.947714e-02 8.363618e-02
 [69] 6.960396e-02 5.733801e-02
 [71] 4.675414e-02 3.773692e-02
 [73] 3.014961e-02 2.384327e-02
 [75] 1.866461e-02 1.446241e-02
 [77] 1.109255e-02 8.421534e-03
 [79] 6.328776e-03 4.707791e-03
 [81] 3.466438e-03 2.526496e-03
 [83] 1.822731e-03 1.301654e-03
 [85] 9.201048e-04 6.437955e-04
 [87] 4.458897e-04 3.056862e-04
 [89] 2.074403e-04 1.393411e-04
 [91] 9.264764e-05 6.097590e-05
 [93] 3.972382e-05 2.561608e-05
 [95] 1.635096e-05 1.033101e-05
 [97] 6.461166e-06 3.999890e-06
 [99] 2.451061e-06 1.486720e-06
> plot(x,y1)
```



(B)
```
> y2=pnorm(x,mean=0,sd=1)
> y2
 [1] 2.866516e-07 4.816530e-07
 [3] 8.013697e-07 1.320248e-06
 [5] 2.153811e-06 3.479323e-06
 [7] 5.565743e-06 8.816559e-06
 [9] 1.383023e-05 2.148428e-05
[11] 3.305072e-05 5.035210e-05
[13] 7.596947e-05 1.135152e-04
[15] 1.679855e-04 2.462079e-04
[17] 3.574003e-04 5.138562e-04
[19] 7.317683e-04 1.032198e-03
[21] 1.442193e-03 1.996034e-03
[23] 2.736602e-03 3.716808e-03
```

```
[25] 5.001037e-03 6.666521e-03
[27] 8.804535e-03 1.152131e-02
[29] 1.493850e-02 1.919309e-02
[31] 2.443656e-02 3.083320e-02
[33] 3.855748e-02 4.779035e-02
[35] 5.871452e-02 7.150870e-02
[37] 8.634102e-02 1.033618e-01
[39] 1.226957e-01 1.444345e-01
[41] 1.686293e-01 1.952845e-01
[43] 2.243525e-01 2.557301e-01
[45] 2.892574e-01 3.247181e-01
[47] 3.618436e-01 4.003175e-01
[49] 4.397847e-01 4.798600e-01
[51] 5.201400e-01 5.602153e-01
[53] 5.996825e-01 6.381564e-01
[55] 6.752819e-01 7.107426e-01
[57] 7.442699e-01 7.756475e-01
[59] 8.047155e-01 8.313707e-01
[61] 8.555655e-01 8.773043e-01
[63] 8.966382e-01 9.136590e-01
[65] 9.284913e-01 9.412855e-01
[67] 9.522096e-01 9.614425e-01
[69] 9.691668e-01 9.755634e-01
[71] 9.808069e-01 9.850615e-01
[73] 9.884787e-01 9.911955e-01
[75] 9.933335e-01 9.949990e-01
[77] 9.962832e-01 9.972634e-01
[79] 9.980040e-01 9.985578e-01
[81] 9.989678e-01 9.992682e-01
[83] 9.994861e-01 9.996426e-01
[85] 9.997538e-01 9.998320e-01
[87] 9.998865e-01 9.999240e-01
[89] 9.999496e-01 9.999669e-01
[91] 9.999785e-01 9.999862e-01
[93] 9.999912e-01 9.999944e-01
[95] 9.999965e-01 9.999978e-01
[97] 9.999987e-01 9.999992e-01
[99] 9.999995e-01 9.999997e-01
> plot(x,y2)
```