PROBABILITY AND STATISTICS

LAB ASSIGNMENT - 5
(Continuous Probability Distribution)

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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.

```
# q1
#(a)
punif(45,min=0,max=60,lower.tail=FALSE)
#(b)
punif(30,min=0,max=60) - punif(20,min=0,max=60)
```

Output:

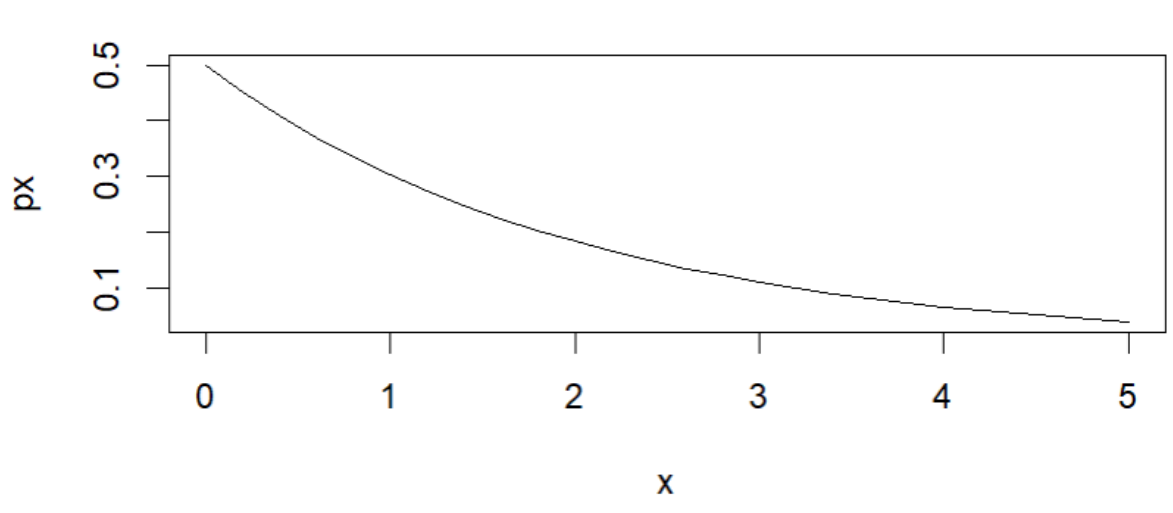
```
> punif(45,min=0,max=60,lower.tail=FALSE)
[1] 0.25
> punif(30,min=0,max=60) - punif(20,min=0,max=60)
[1] 0.1666667
```

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.

```
# q2
#(a)
dexp(3,rate=1/2
```

```
> #(a)
> dexp(3,rate=1/2)
[1] 0.1115651
```

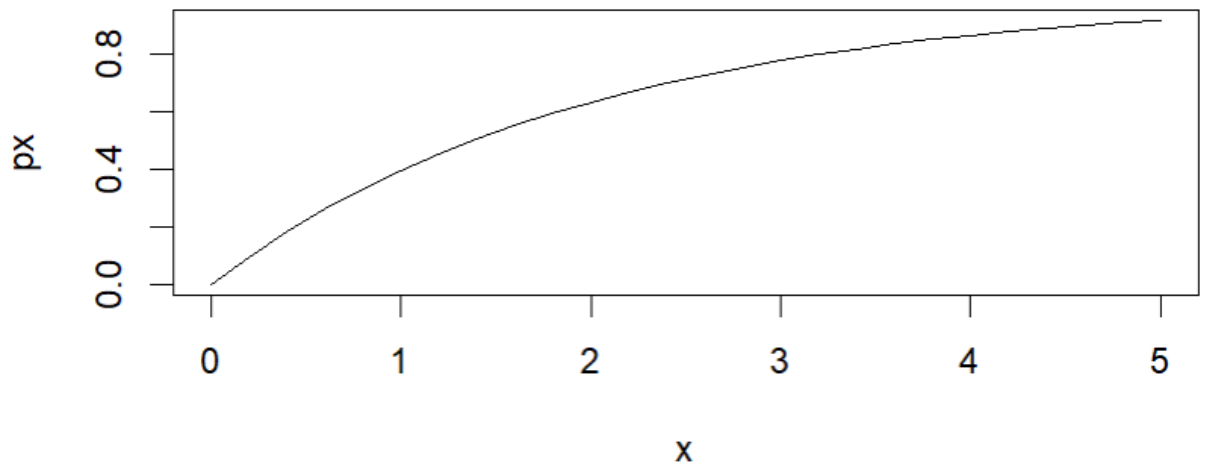
```
#(b)
x = seq(0,5,0.2)
px<-dexp(x,rate=1/2)
plot(x,px,type='l')
```



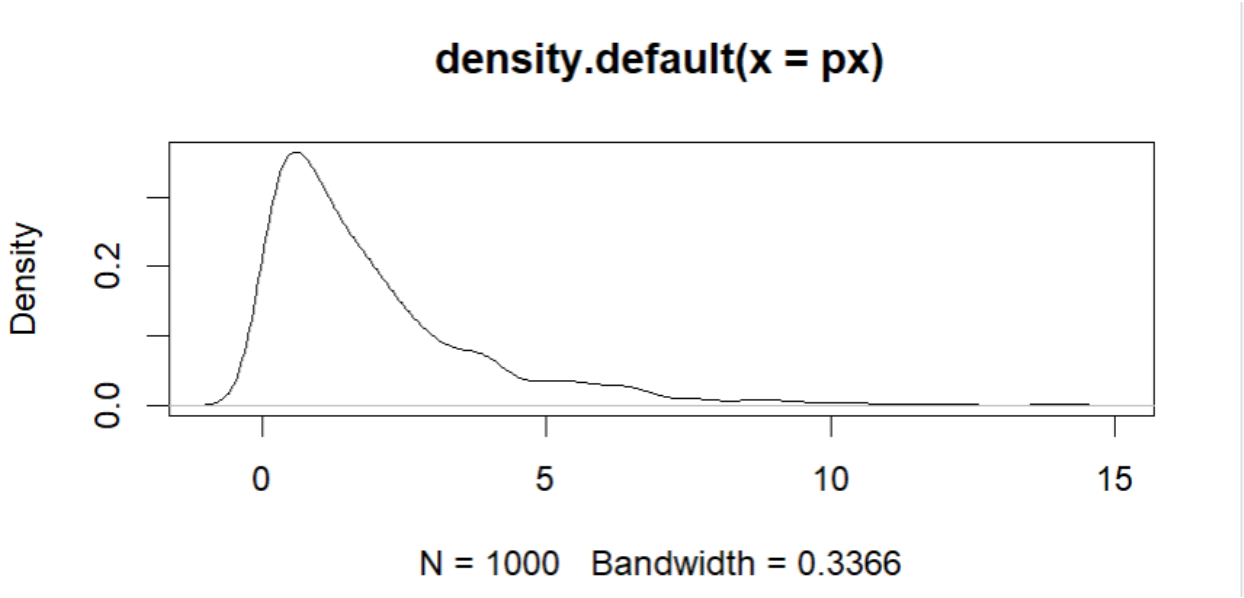
```
#(c)
diff(pexp(c(0,3),rate=1/2))
```

```
> #(c)
> diff(pexp(c(0,3),rate=1/2))
[1] 0.7768698
```

```
#(d)
x = seq(0,5,0.2)
px<-pexp(x,rate=1/2)
plot(x,px,type='l')
```




```
# (e)
x=1000
px<-rexp(x,rate=1/2)
plot(density(px))
```



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())

```
# q3
# a(ii)
pgamma(1,shape=2,scale=1/3)

# b
qgamma(0.7,shape=2,scale=1/3)
```

Output :

```
> # q3
> # a(ii)
> pgamma(1,shape=2,scale=1/3)
[1] 0.8008517
>
> # b
> qgamma(0.7,shape=2,scale=1/3)
[1] 0.8130722
```