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Probability and Statistics (UCS410)

Experiment 5

(Continuous Probability Distributions)

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

```
> punif(45, 0, 60, lower.tail=FALSE)
[1] 0.25
```

   (b) waiting time lies between 20 and 30 minutes.

```
> punif(30, 0, 60)-punif(20, 0, 60)
[1] 0.1666667
```

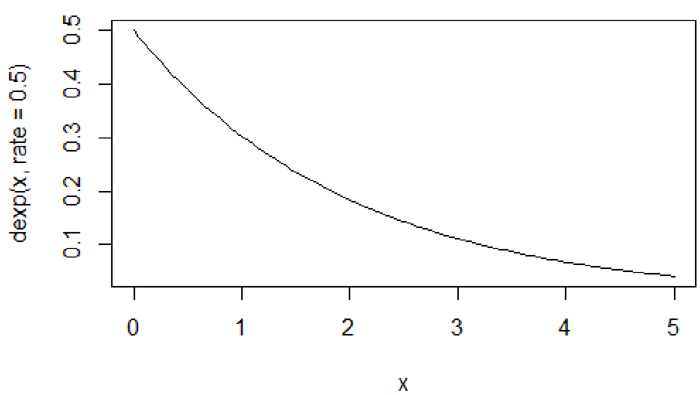
2. The time (in hours) required to repair a machine is an exponential distributed random variable with parameter $\lambda = 1/2$.

   (a) Find the value of density function at x = 3.

```
> dexp(3, rate=0.5)
[1] 0.1115651
```

   (b) Plot the graph of exponential probability distribution for $0 \leq x \leq 5$.

```
> curve(dexp(x, rate=0.5), from=0, to=5)
```

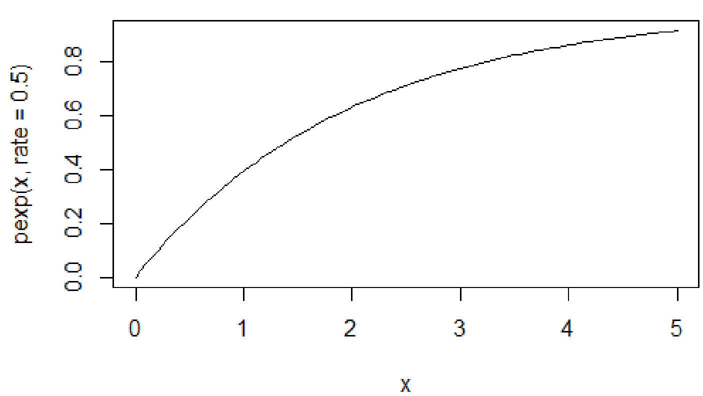


   (c) Find the probability that a repair time takes at most 3 hours.

```
> pexp(3, rate=0.5)
[1] 0.7768698
```

   (d) Plot the graph of cumulative exponential probabilities for $0 \leq x \leq 5$.

```
> curve(pexp(x, rate=0.5), from=0, to=5)
```



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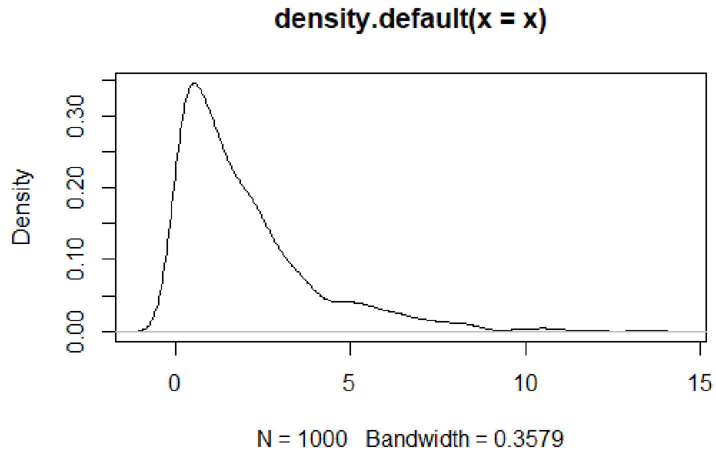
(e) Simulate 1000 exponential distributed random numbers with λ = ½ and plot the simulated data.

```
> x<-rexp(1000, rate=0.5)
> plot(density(x))
```



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

```
> dgamma(3, shape=2, scale=1/3)
[1] 0.003332065
```

(ii)at least 1 unit of time.

```
> pgamma(1, shape=2, scale=1/3, lower.tail=FALSE)
[1] 0.1991483
```

(b) What is the value of c, if $P(X \le c) \ge 0.70$? (**Hint:** try quantile function qgamma())

```
> qgamma(0.7, shape=2, scale=1/3)
[1] 0.8130722
```