BB503/BB602 - R Training - Week VI

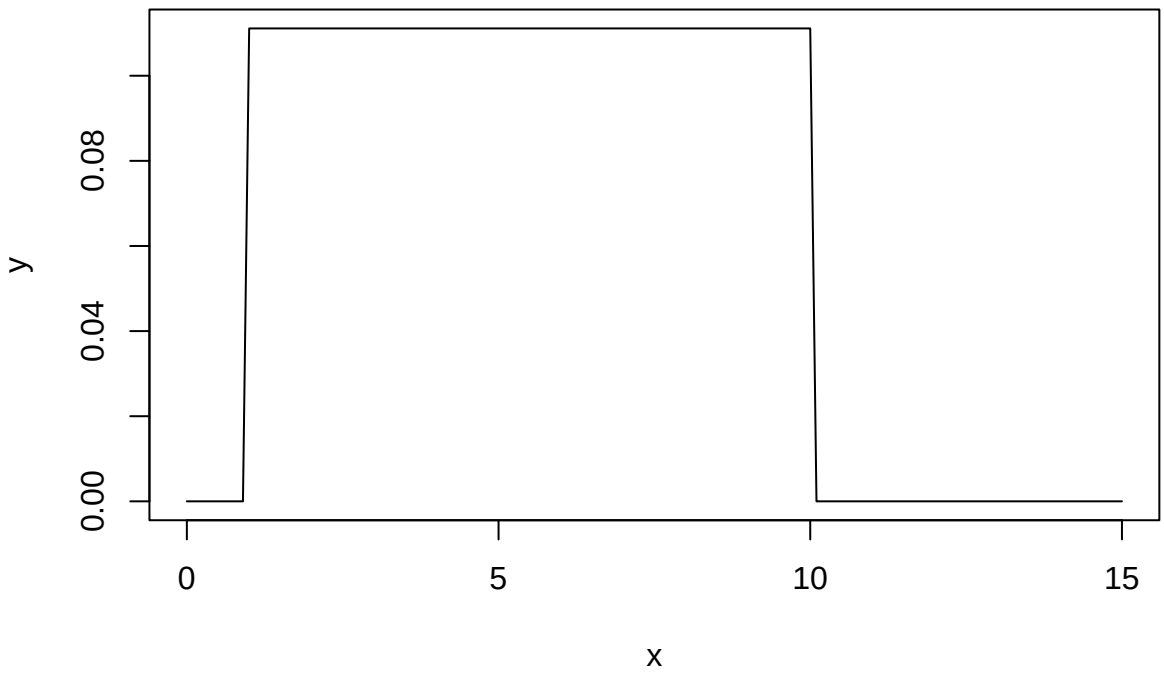
Ege Ulgen

Continuous Distributions

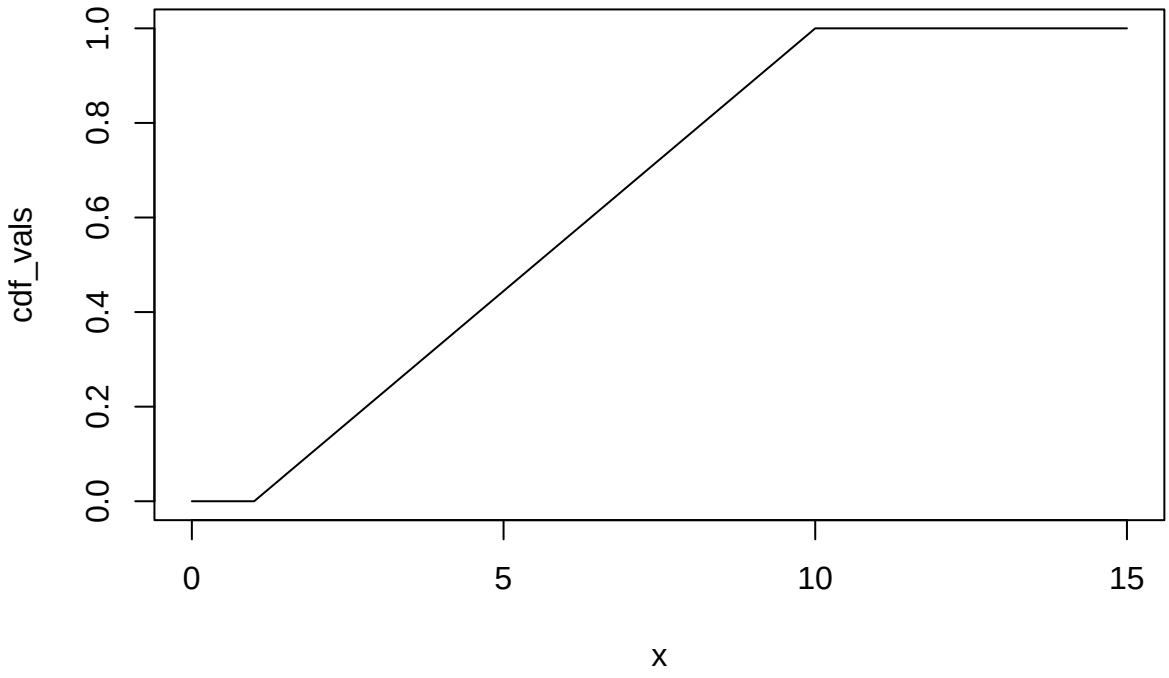
Continuous Uniform Distribution

```
# Continuous Uniform Distribution [1, 10]

# d** returns the density
x <- seq(0, 15, 0.1)
y <- dunif(x, min = 1, max = 10)
plot(x, y, type = "l")
```




```
# p** is the CDF (P(X<=x))
cdf_vals <- punif(x, min = 1, max = 10)
plot(x, cdf_vals, type = "l")
```




```
# q** is the quantile function
qunif(0.5, min = 1, max = 10)
```

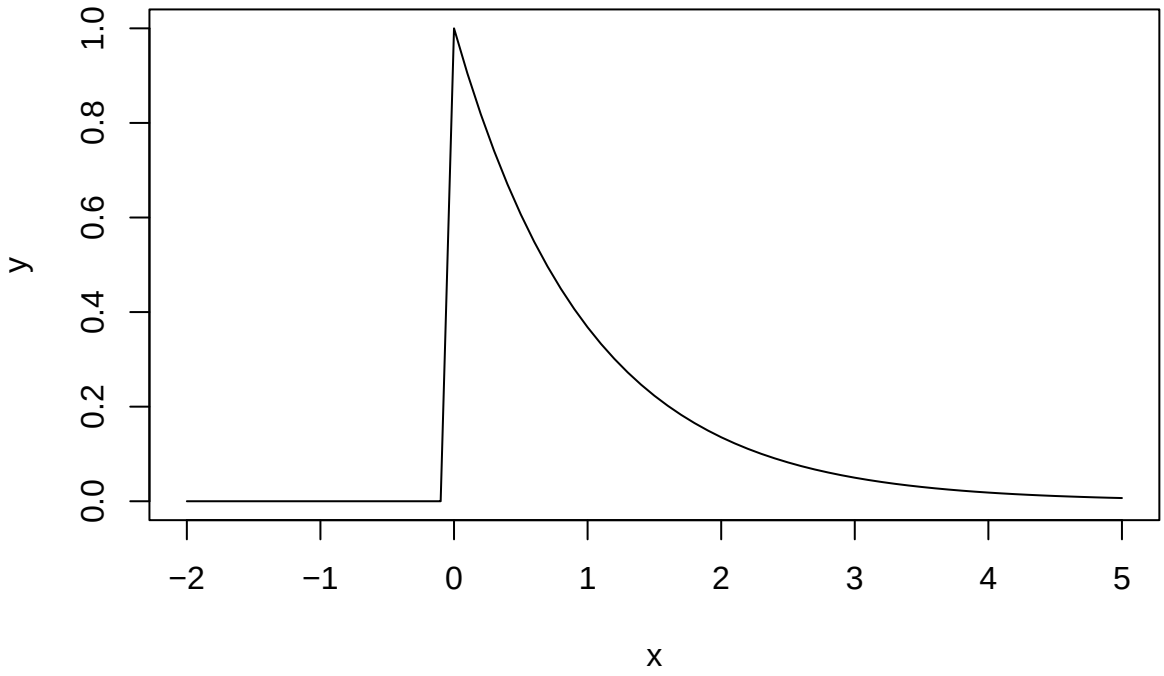
```
## [1] 5.5
```

```
# r** is the random number generator (random numbers that follow the given distribution)
set.seed(123)
runif(10, min = 1, max = 10)
```

```
##  [1] 3.5882 8.0947 4.6808 8.9472 9.4642 1.4100 5.7529 9.0318 5.9629 5.1095
```

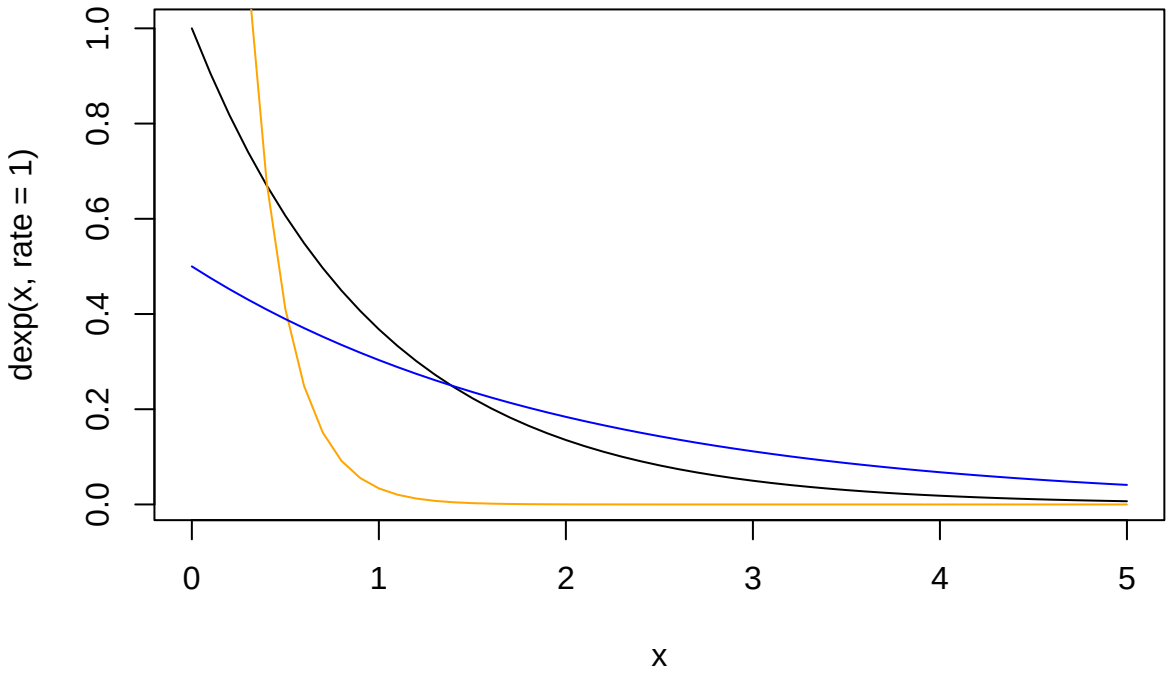
Exponential Distribution

```
# d** returns the density
x <- seq(-2, 5, 0.1)
y <- dexp(x, rate = 1)
plot(x, y, type = "l")
```



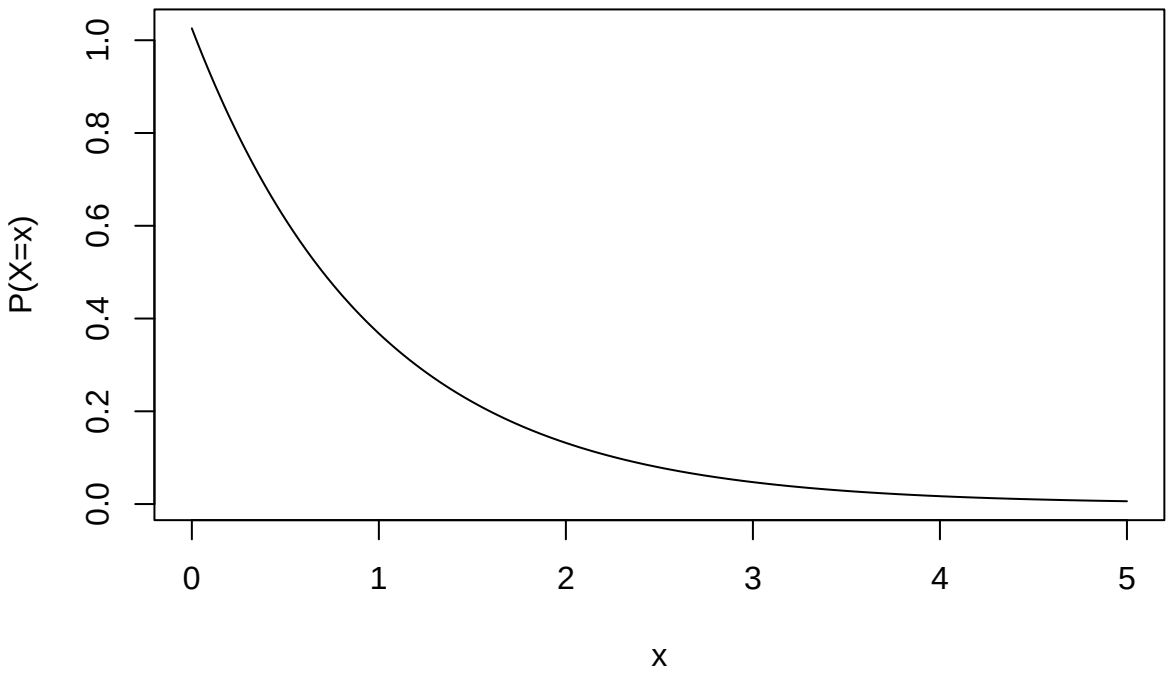

```
# the effect of changing rate
x <- seq(0, 5, 0.1)

plot(x, dexp(x, rate = 1), type = "l")
lines(x, dexp(x, rate = 5), col = "orange")
lines(x, dexp(x, rate =.5), col = "blue")
```



The time between heart beats is measured in milliseconds (msec) and is called an "R-R interval" or "inter-beat interval (IBI)". Assume that mean IBI is 975 msec. (Thus the rate is 1 / 0.975 sec = 1.0256 Hz)

```
rate <- 1 / .975
plot(seq(0, 5, 0.01), dexp(seq(0, 5, 0.01), rate = rate), type = "l", xlab = "x", ylab = "P(X=x)")
```



What is the probability that the time between two heart beats is longer than 2 seconds?

```
1 - pexp(2, rate)
```

```
## [1] 0.12857
```

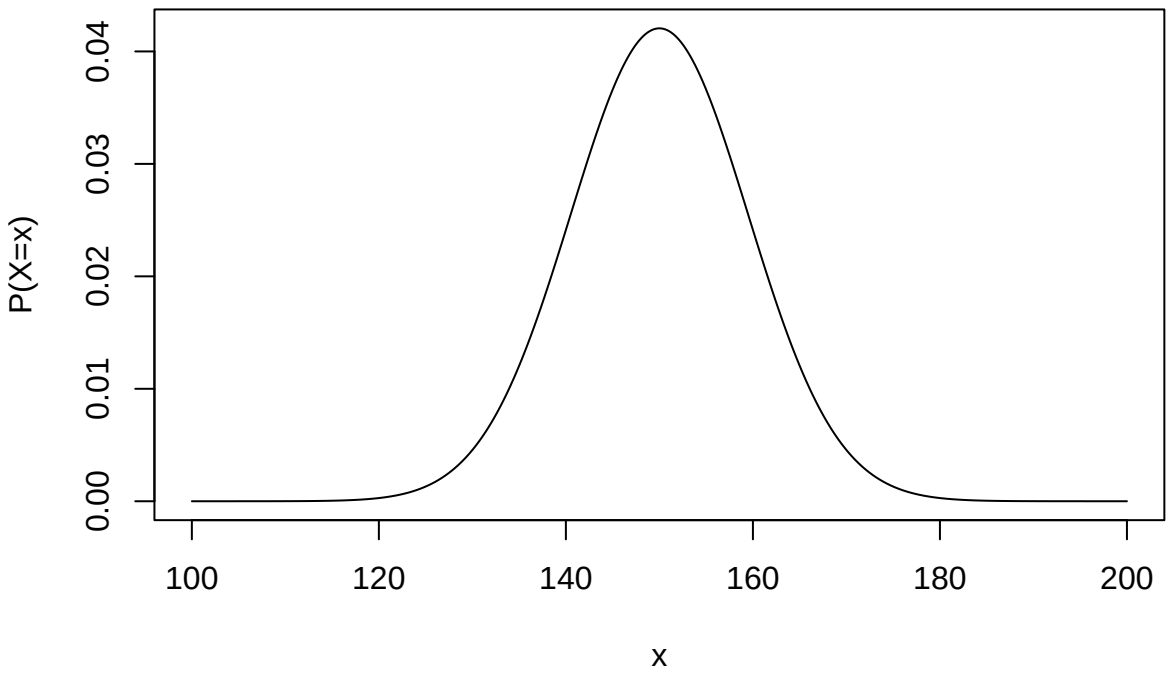
```
pexp(2, rate = rate, lower.tail = FALSE)
```

```
## [1] 0.12857
```

Normal Distribution

In a cardiology deparment, it is known that the systolic blood pressure (SBP) is distributed normally with a mean of 150 and a variance of 90.

```
x <- seq(100, 200, 0.01)
plot(x, dnorm(x, mean = 150, sd = sqrt(90)), type = "l", xlab = "x", ylab = "P(X=x)")
```



For a randomly-selected patient:

a) What is the probability that their SBP is less than 110?

```
pnorm(110, mean = 150, sd = sqrt(90))
```

```
## [1] 1.2413e-05
```

b) What is the probability that their SBP is more than 120?

```
pnorm(120, mean = 150, sd = sqrt(90), lower.tail = FALSE)
```

```
## [1] 0.99922
```

c) What is the probability that their SBP is between 90 and 160?

```
pnorm(160, mean = 150, sd = sqrt(90)) - pnorm(90, mean = 150, sd = sqrt(90))
```

```
## [1] 0.85408
```