# R PDF computation

Density function

Suppose `x` is a time series of monthly temperature data:

```
x<-rnorm(100,mean=18,sd=4)
summary(x)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   8.022  15.260  18.110  17.840  20.180  26.010
```

We use `density()` function that uses `approx` to do linear interpolation; `approx` points out that `approxfun()` generates a suitable function:

```
plot(density(x))
```


density.default(x = x)
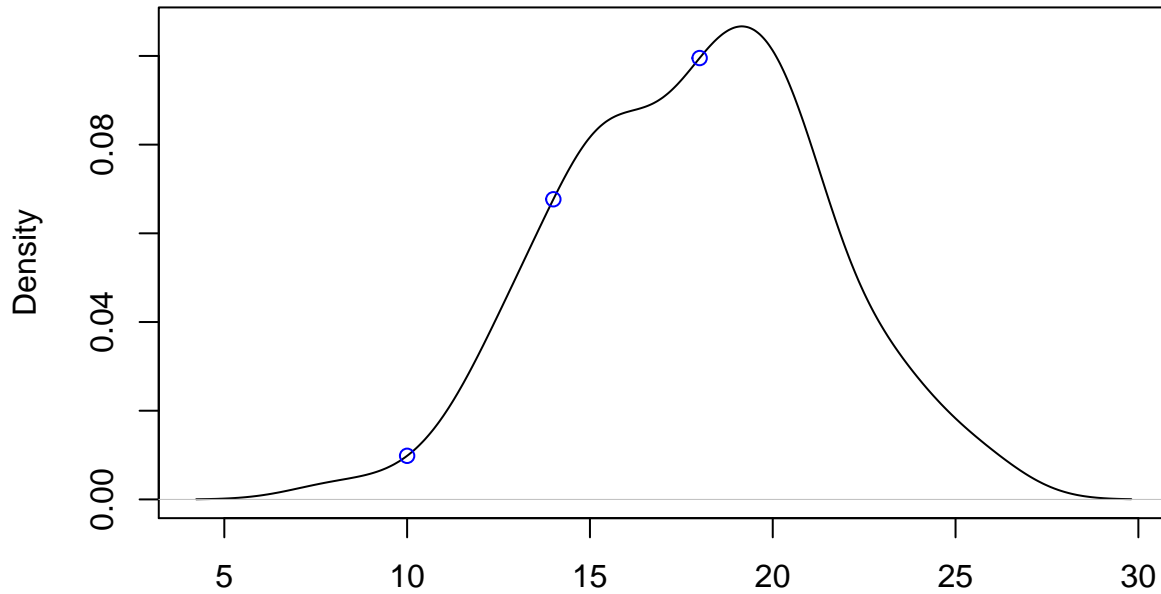
N = 100   Bandwidth = 1.264
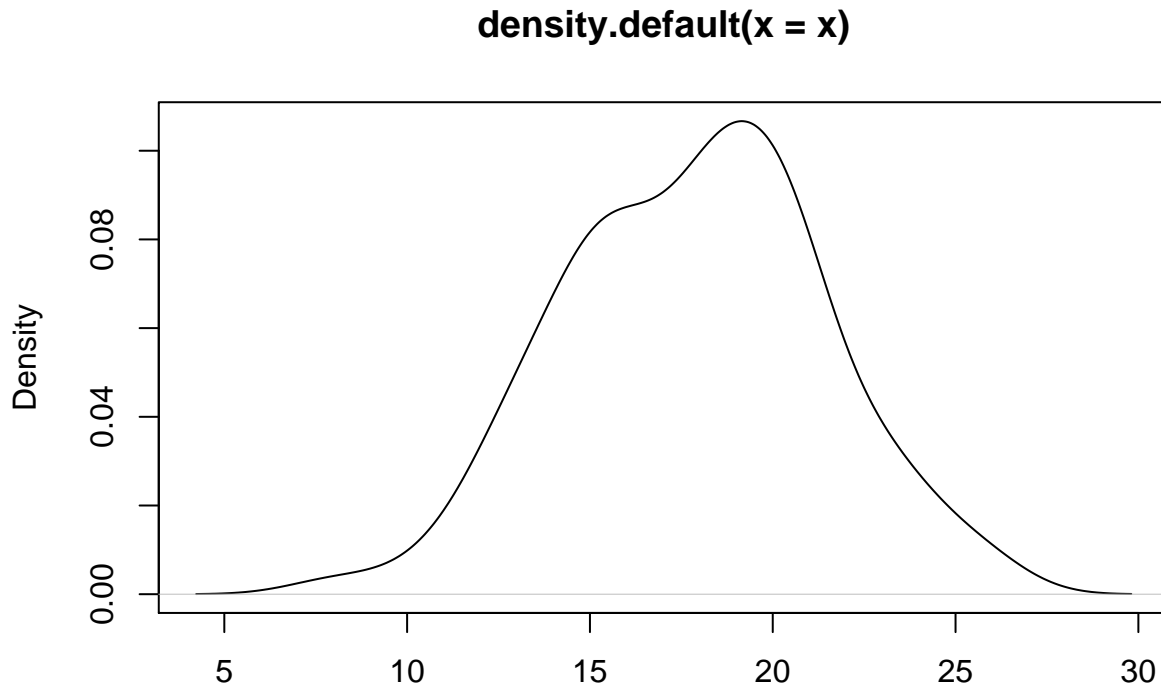
```
density_function<- approxfun(density(x))
```

Let us calculate the density of 3 points over the estimated density function and plot them:

```
x_new <- c(10,14,18)
plot(density(x))
points(x_new,density_function(x_new),col=4)
```

density.default(x = x)

N = 100   Bandwidth = 1.264

```
density_function(x_new)
```

```
## [1] 0.009827715 0.067679705 0.099525348
```

Finally, the probability that x takes on a value in the interval $[a, b]$ is the area above this interval and under the graph of the density function.