

# Lecture Notes

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# Chapter 1

## Distributions

### 1.1 How do I get started

The R package `xtable` is useful. For a description of the bootstrap, see Efron (1979). A good book is (Cormen et al., 2009). This is Section 1.1. Check `index.Rmd` to see which R packages are loaded.

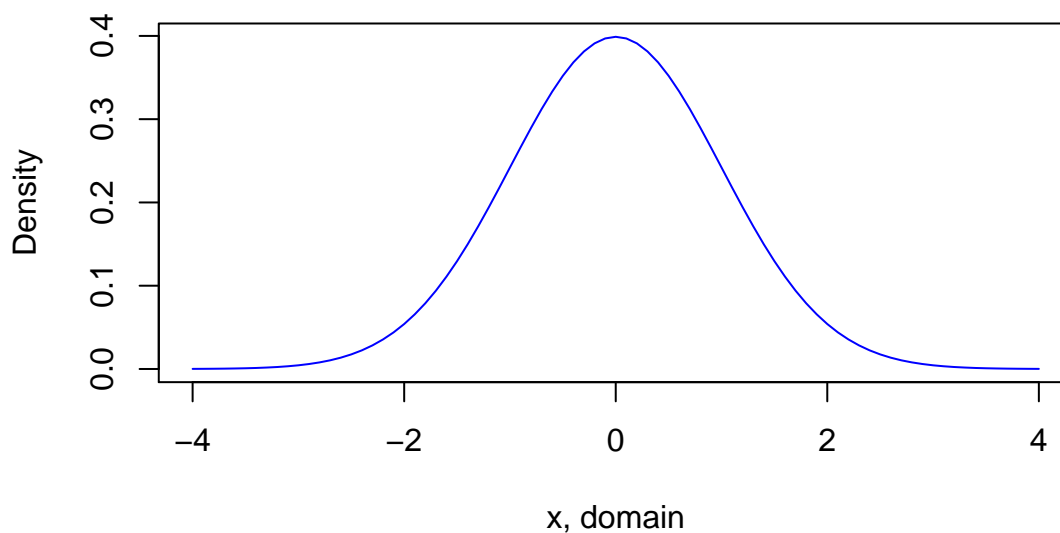
### 1.2 Normal Distribution

The probability density function for the standard normal distribution is (blanked out):

(1.1)

Equation (1.1) is awesome.

Here is a plot of the probability density function of a standard normal:



### 1.3 Gamma distribution

The gamma distribution has two parameters, shape  $k$  and scale  $\theta$ , and is denoted  $\Gamma(k, \theta)$ . Data for a  $\Gamma(1, 2)$  distribution can be generated as follows:

```
# We set the seed here
set.seed(1)
k <- 1
ylab <- "Value" # set elsewhere
theta <- 2
x <- rgamma(10, shape=k, scale=theta)
print(x)
#> [1] 0.31028 3.76480 3.60902 1.67236 2.44509 2.31671 1.98004
#> [8] 0.61475 0.18924 0.31440
```

And here is the data plotted in Figure 1.1:

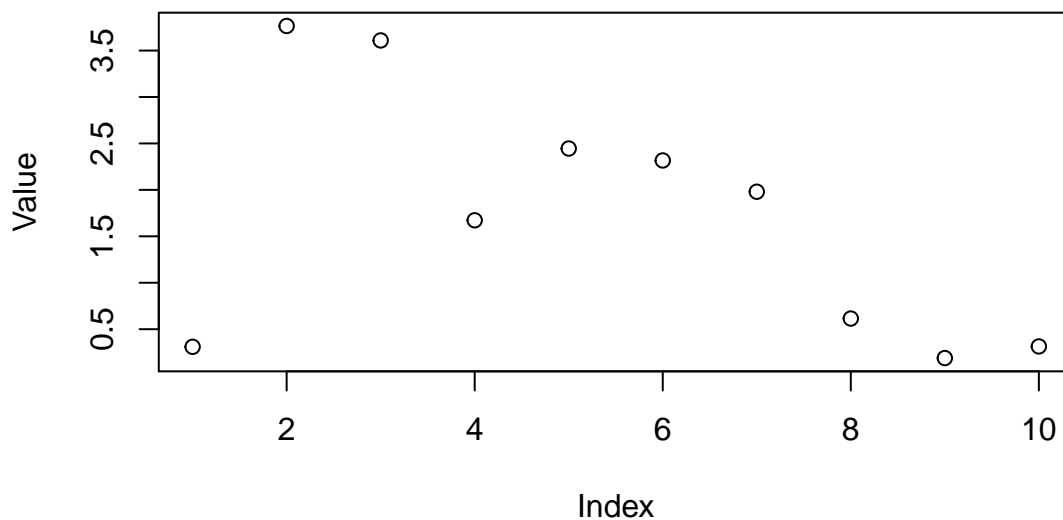
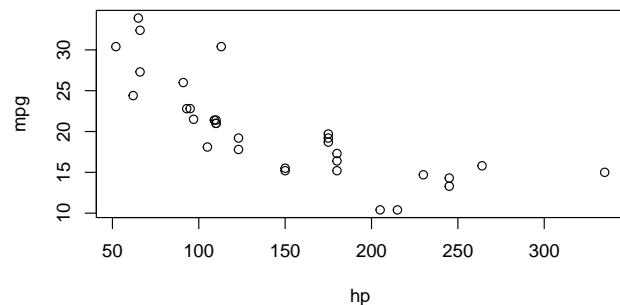


Figure 1.1: Gamma data for  $\Gamma(1, 2)$

Figure 1.1 should be above this line.

## 1.4 Cars

Here is some `cars` data:



(a) A figure caption

	mpg	cyl	disp	hp	drat	wt
<i>Mazda RX4</i>	21	6	160	110	3.9	2.62
<i>Mazda RX4 Wag</i>	21	6	160	110	3.9	2.875
<i>Datsun 710</i>	22.8	4	108	93	3.85	2.32
<i>Hornet 4 Drive</i>	21.4	6	258	110	3.08	3.215
<i>Hornet Sportabout</i>	18.7	8	360	175	3.15	3.44
<i>Valiant</i>	18.1	6	225	105	2.76	3.46

(b) A table caption

Figure 1.2: Caption text for Figure and Table

Look at Figure 1.2, it contains a figure (a) and a table (b).

Here is a box of text, using `ftext` command:

Don't take the following too seriously.



See the code for this ‘align’ example for an example of creating a gapped ‘align’.

Here is an aligned equation, need to use in `ftext`:

	(1.2)
$z = 2$	(1.3)

Equation (1.2) is blank in an align environment.

Using `fequation`:

$t = 1$	(1.4)
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It might be useful to include notes on the side, in the margin. These can be done using `sidenote`. Here is an example of a sidenote And more text goes here, and one can read the note in the margin to remember certain points.

## 1.5 tikz figures

Here is a figure created using `tikz`, which creates an intermediate tex and pdf.

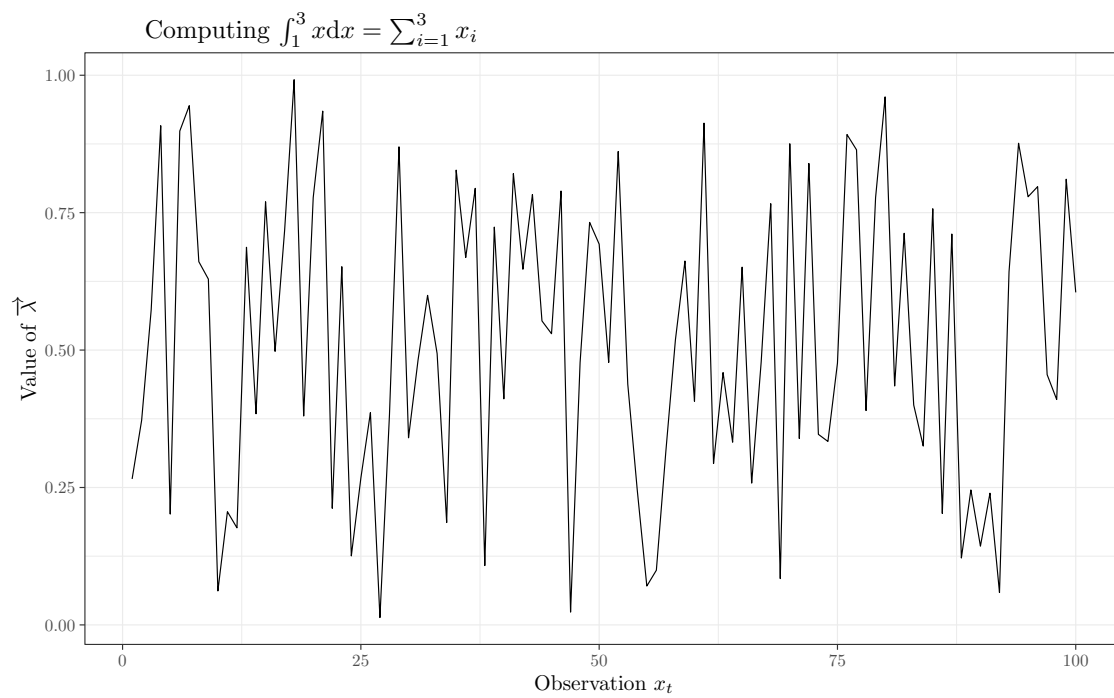


Figure 1.3: Caption for tikz figure showing  $\vec{\lambda}$ , and with a sum  $\sum_{i=1}^3 x_i$ .



# Bibliography

Cormen, T. H., Leiserson, C. E., Rivest, R. L., and Stein, C. (2009). *Introduction to Algorithms*. MIT Press, 3rd edition.

Efron, B. (1979). Bootstrap methods: Another look at the jackknife. *The Annals of Statistics*, 7(1):1–26.