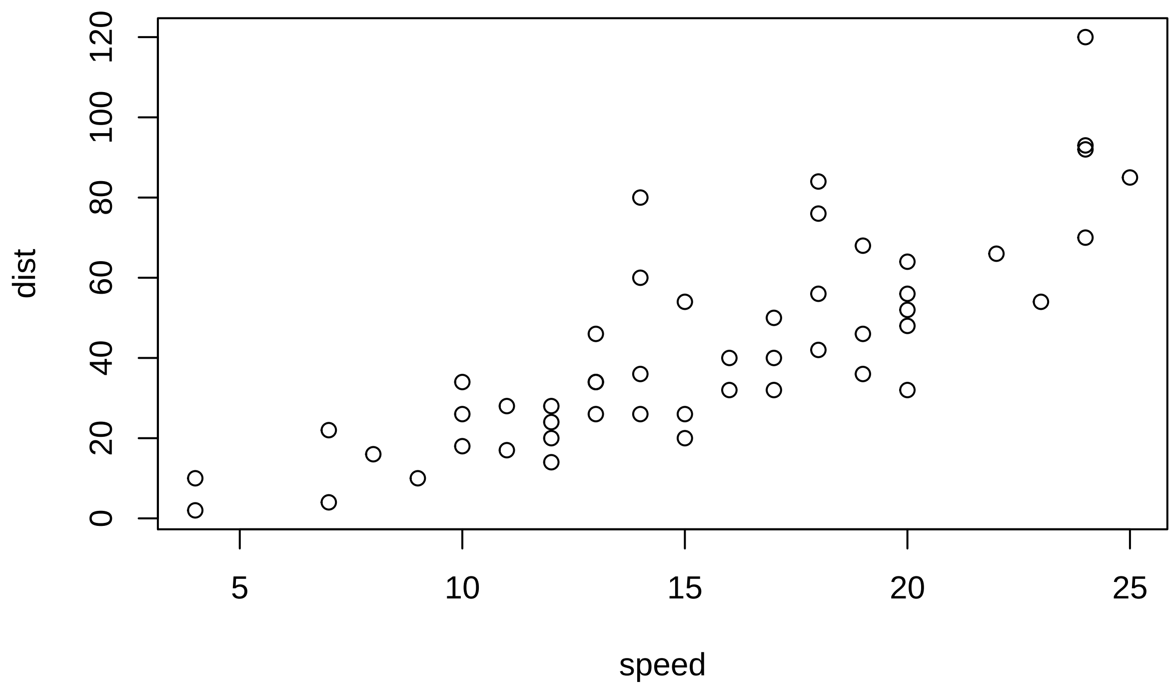
Lecture 01: Introduction

This is an R Markdown Notebook. When you execute code within the notebook, the results appear beneath the code.

Try executing this chunk by clicking the *Run* button within the chunk or by placing your cursor inside it and pressing *Ctrl+Shift+Enter*.

```
plot(cars)
```



Add a new chunk by clicking the *Insert Chunk* button on the toolbar or by pressing *Ctrl+Alt+I*.

When you save the notebook, an HTML file containing the code and output will be saved alongside it (click the *Preview* button or press *Ctrl+Shift+K* to preview the HTML file).

The preview shows you a rendered HTML copy of the contents of the editor. Consequently, unlike *Knit*, *Preview* does not run any R code chunks. Instead, the output of the chunk when it was last run in the editor is displayed.

Lecture 01 Figures

Figure 1: Gamma function integrand for $x = 1/2$

```r
curve( x^(-1/2) * exp( -x ), 0, 3, main = "Gamma function integrand, x = 1/2",
       lwd = 2, col = "red", ylab = "f(t)", xlab = "t")
```

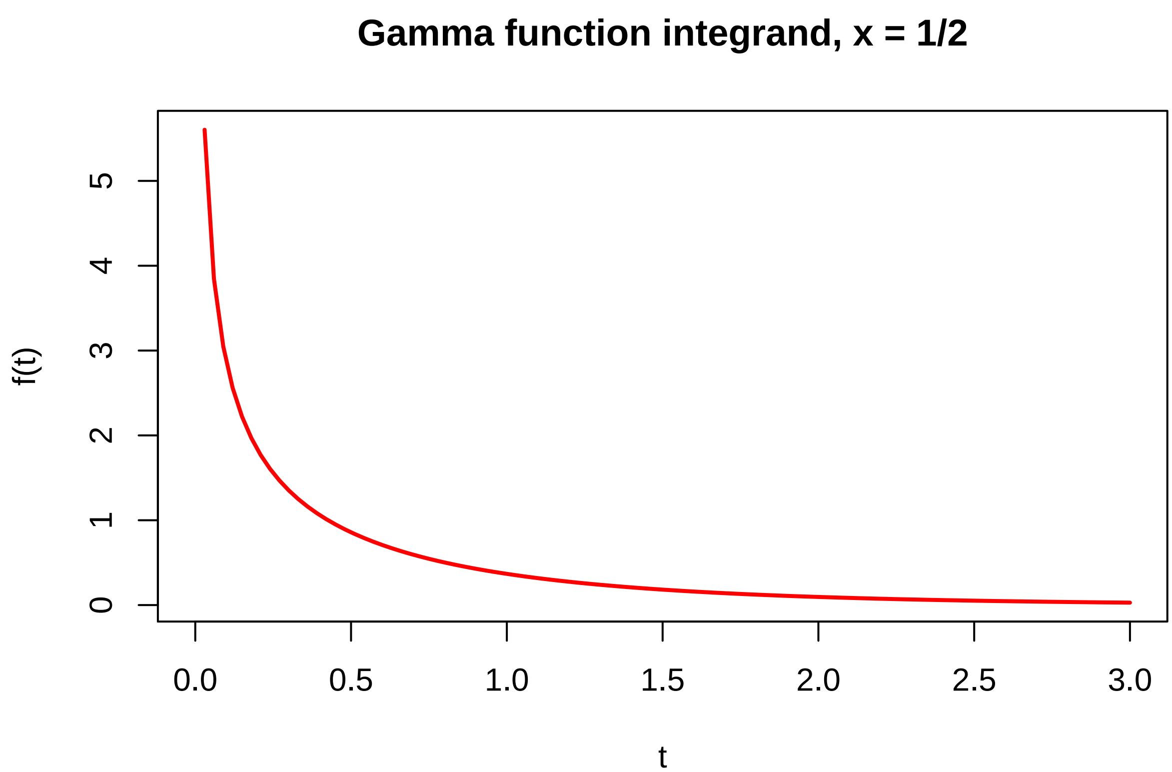


Figure 2: Gamma function integrand for $x = 1$

```r
curve( exp( -x ), 0, 3, main = "Gamma function integrand, x = 1",
       lwd = 2, col = "blue", ylab = "f(t)", xlab = "t")
```

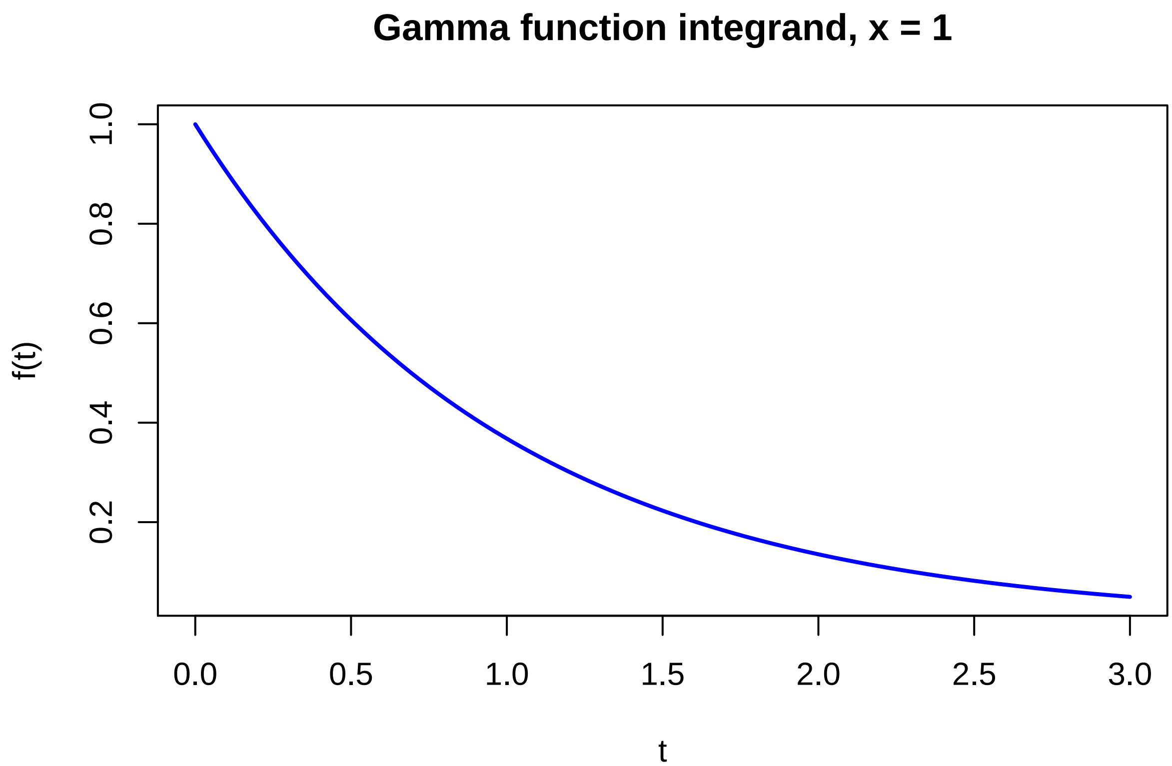
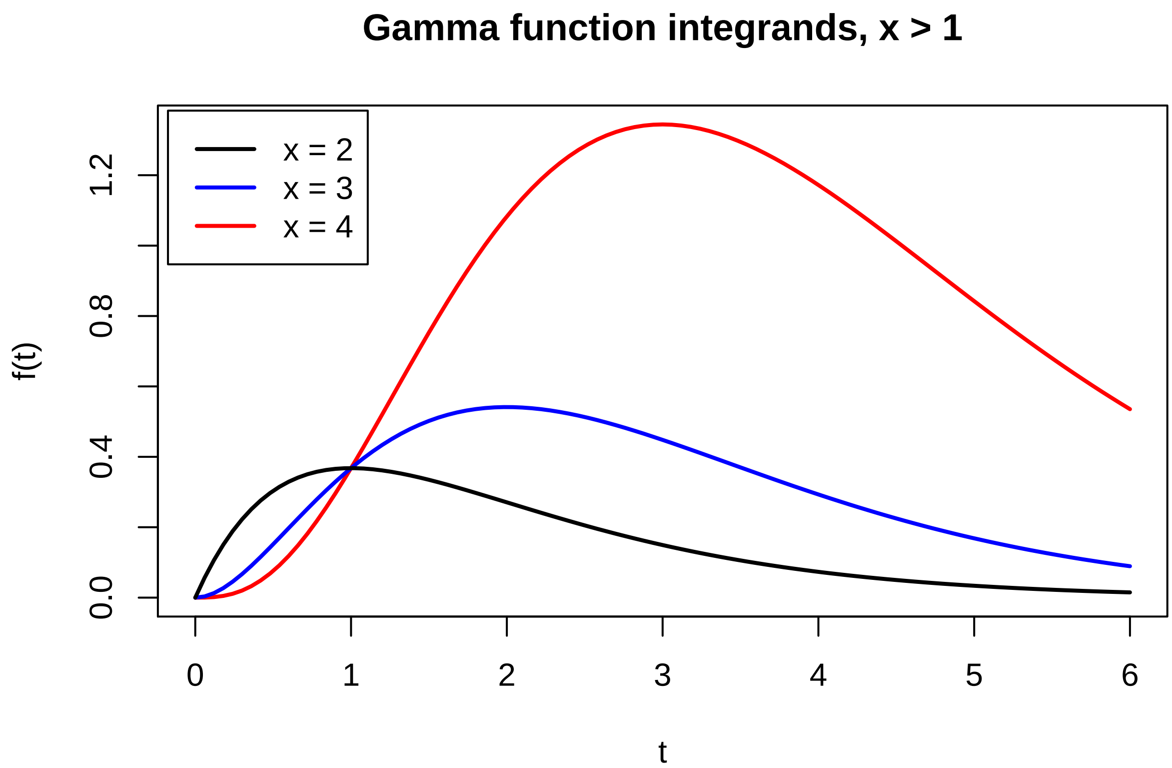


Figure 3: Gamma function integrand for $x > 1$

```
curve( x^3 * exp( -x ), 0, 6, lwd = 2, col = "red", xlab = "t",
       ylab = "f(t)", main = "Gamma function integrands, x > 1" )
curve( x^2 * exp( -x ), 0, 6, lwd = 2, col = "blue", add = TRUE )
curve( x * exp( -x ), lwd = 2, 0, 6, add = TRUE )
legend( "topleft", inset = 0.01, legend <- c("x = 2", "x = 3", "x = 4"),
        lwd = 2, lty = 1,
        col = c( "black", "blue", "red"))
```



Gamma Functions

Let's calculate some values of the gamma function.

Here's $\Gamma(1)$:

```
gamma(1)
```

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

How about $\Gamma(3)$:

```
gamma(2)
```

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

And this is $\Gamma(6)$:

```
gamma(6)
```

```
## [1] 120
```

Let's do a non-integer:

```
gamma(3.7)
```

```
## [1] 4.170652
```

Finally, note that we get the same answer using the fundamental recurrence relation:

```r
2.7 * 1.7 * gamma(1.7)
```

```
## [1] 4.170652
```