User-defined functions

- If a specific task is desired but there is no such predefined function in R…

- fname <- function (*arg1*, *arg2*, …) statement

  - *arg1*, *arg2*, … are the input variables

  - *statement* is the body of the function, usually enclosed within braces {} for a grouped statement

- example:

```
xsq <- function(x) x^2
xsq(5)
```

Optimization

- Minimize (or maximize) a function over the parameter space

- optim(*par*, *fn*, *lower*, *upper*, *method*)

  - *par* are the initial values for the parameters to be optimized over

  - *fn* is the function to be optimized

  - *lower*, *upper* is the lower and upper bound of the parameters to be optimized over

  - *method* select the optimization algorithm

  - add *control=(list(fnscale=-1))* for maximization

Optimization

- Example function $f(x) = x^3 - 5x^2 + 3$

```
func1 <- function(x) x^3 - 5*x^2 + 3
plot(func1, 1, 10, n=100, xlab="x",
   ylab="func1", type='l', las=1)
```

- minimization using optim:

```
optim(10, func1, lower=1, upper=10)
$par
[1] 3.333333
$value
[1] -15.51852
```