Functions as Objects
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But what about functions?

In fact function values are treated as objects in Scala.

The function type $A \Rightarrow B$ is just an abbreviation for the class `scala.Function1[A, B]`, which is defined as follows.

```scala
package scala
trait Function1[A, B] {
  def apply(x: A): B
}
```

So functions are objects with apply methods.

There are also traits `Function2`, `Function3`, … for functions which take more parameters (currently up to 22).
An anonymous function such as

\[(x: \text{Int}) => x \ast x\]

is expanded to:
Expansion of Function Values

An anonymous function such as

\[(x: \text{Int}) \Rightarrow x \times x\]

is expanded to:

```scala
{ class AnonFun extends Function1[Int, Int] {
    def apply(x: Int) = x * x
}
    new AnonFun
}
```
An anonymous function such as

\[(x: \text{Int}) \Rightarrow x \times x\]

is expanded to:

```scala
{ class AnonFun extends Function1[Int, Int] {
  def apply(x: Int) = x * x
}
  new AnonFun
}
```

or, shorter, using *anonymous class syntax*:

```scala
new Function1[Int, Int] {
  def apply(x: Int) = x * x
}
```
A function call, such as \( f(a, b) \), where \( f \) is a value of some class type, is expanded to

\[
f.\text{apply}(a, b)
\]

So the OO-translation of

\[
\text{val } f = (x: \text{Int}) \Rightarrow x \times x
\]

\[
f(7)
\]

would be

\[
\text{val } f = \text{new } \text{Function1[Int, Int]} \{
  \text{def } \text{apply}(x: \text{Int}) = x \times x
\}

f.\text{apply}(7)
Functions and Methods

Note that a method such as

```scala
def f(x: Int): Boolean = ...
```

is not itself a function value.

But if f is used in a place where a Function type is expected, it is converted automatically to the function value

```scala
(x: Int) => f(x)
```

or, expanded:

```scala
new Function1[Int, Boolean] {
  def apply(x: Int) = f(x)
}
```
Exercise

In package week4, define an

```java
object List {
    ...
}
```

with 3 functions in it so that users can create lists of lengths 0-2 using syntax

```java
List()     // the empty list
List(1)    // the list with single element 1
List(2, 3) // the list with elements 2 and 3.
```