# Calculus exercises (Unit 5)

Guilherme Amorim

2024-10-16

## Calculus exercises (Unit 5)

### Installation

```
# install.packages("mosaic")

library(mosaic)
```

### First function

```
f <- makeFun(
    m * x + b ~ x,
    m = 3.5,
    b = 10)

f(x = 2)
```

```
## [1] 17
```

### Second function

```
g <- makeFun(A * x * cos(pi * x * y) ~ x + y, A = 3)
g
```

```
## function (x, y, A = 3)
## A * x * cos(pi * x * y)
```

```
g(x = 1, y = 2)
```

```
## [1] 3
```

## Derivative functions

i.e. curve tangent

```
D(expression(2*x^3),"x")
```

```
## 2 * (3 * x^2)
```

```
D(expression(log(x)),"x")
```

```
## 1/x
```

```
D(expression(a*exp(-b * x)),"x")
```

```
## -(a * (exp(-b * x) * b))
```

## Integratives

i.e. area under the curve

```
integrate(dnorm,0,Inf)
```

```
## 0.5 with absolute error < 4.7e-05
```

```
integrate(dnorm,-Inf,Inf)
```

```
## 1 with absolute error < 9.4e-05
```

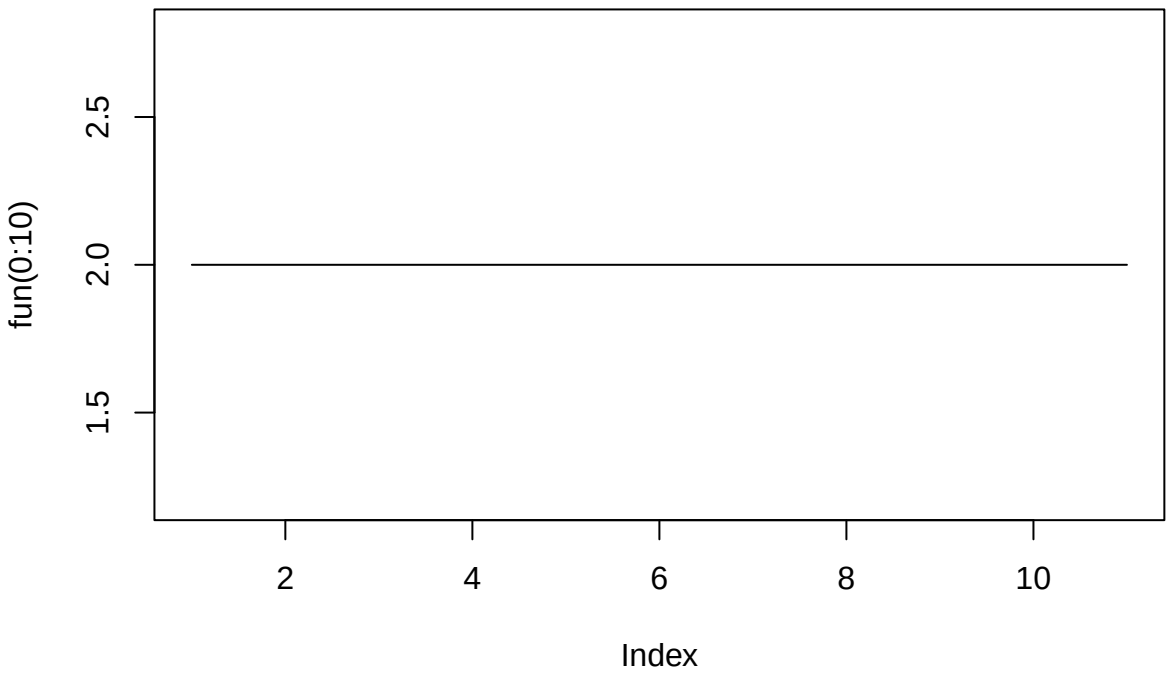
```
fun = function(x) rep(2, length(x))

integrate(function(x) rep(2, length(x)), 0, 1)
```

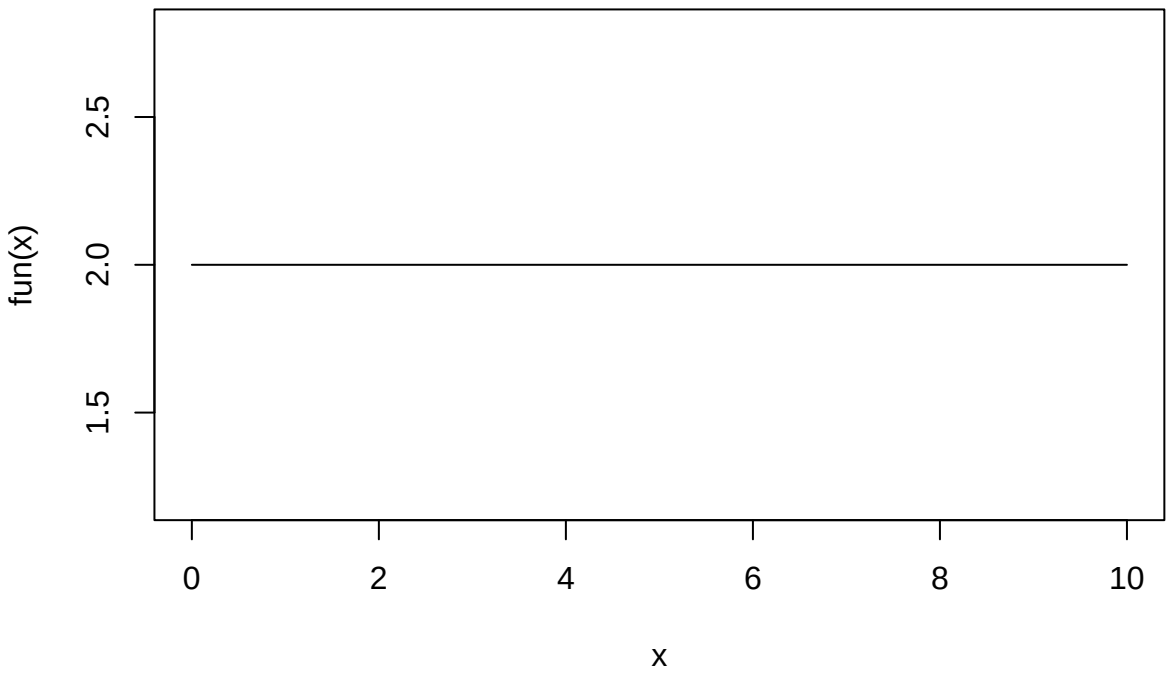
```
## 2 with absolute error < 2.2e-14
```

```
# correct default settings for plotting window
# options(vsc.dev.args = list(width = 800, height = 600))
```

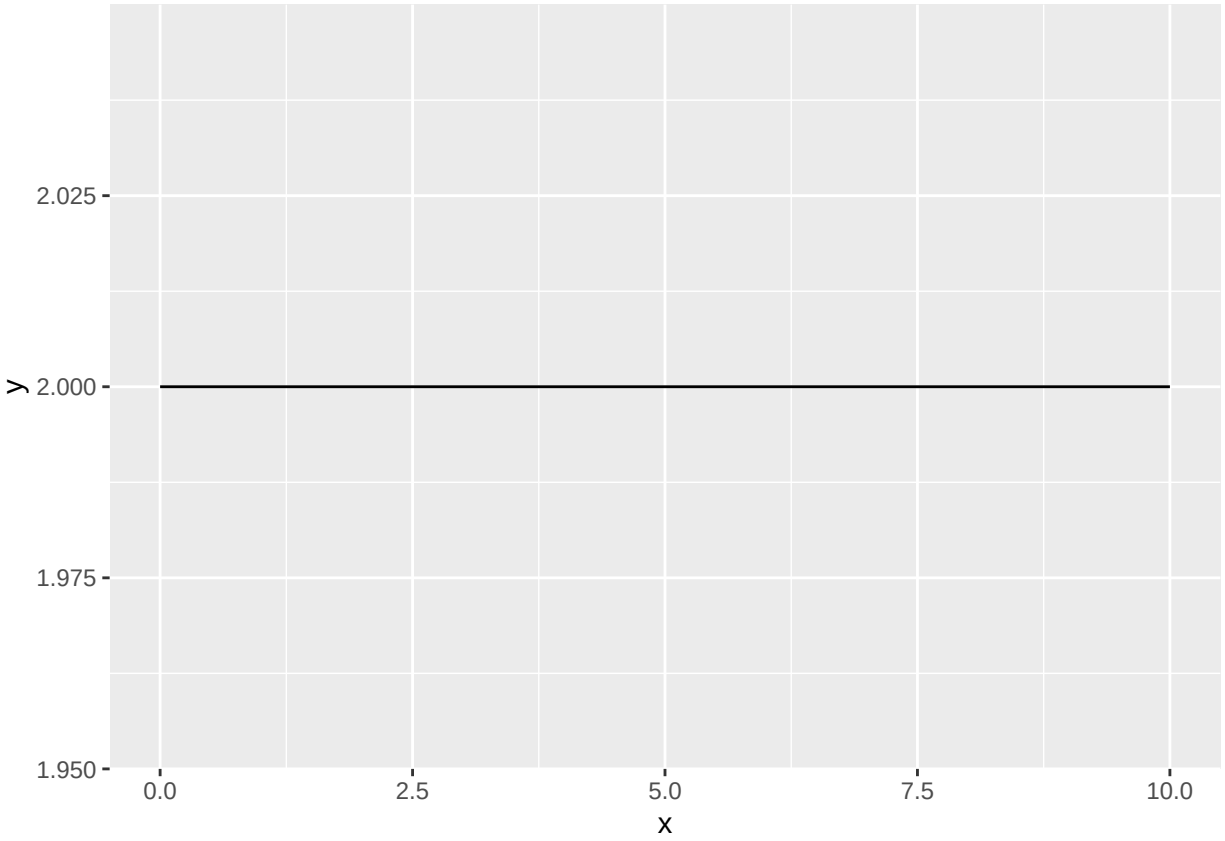
```
# possible visualisations of the function curve
## base R:
plot(fun(0:10), type='l')
```




```
curve(fun(x),0,10)
```




```
## ggplot
ggplot(data.frame(x=c(0, 10)), aes(x=x)) +
 stat_function(fun=fun)
```




```
integrand <-function(x) {1/((x+1)*sqrt(x))}
integrate(integrand, lower = 0, upper = Inf)
```

```
## 3.141593 with absolute error < 2.7e-05
```