Ejercicios.

EJERCICIOS - FUNDAMENTOS DE CALCULO.

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Instalamos y cargamos las librerias necesarias.

```
#install.packages(mosaicCalc)
library(mosaicCalc)
```

```
## Loading required package: mosaicCore
```

```
##
## Attaching package: 'mosaicCalc'
```

```
## The following object is masked from 'package:stats':
##
##     D
```

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

```
## Loading required package: dplyr
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
## Loading required package: lattice
```

```
## Loading required package: ggformula
```

```
## Loading required package: ggplot2
```

```
##
## New to ggformula?  Try the tutorials:
##  learnr::run_tutorial("introduction", package = "ggformula")
##  learnr::run_tutorial("refining", package = "ggformula")
```

```
## Loading required package: mosaicData
```

```
## Loading required package: Matrix
```

```
##
## The 'mosaic' package masks several functions from core packages in order to add
## additional features.  The original behavior of these functions should not be affected by t
his.
##
## Note: If you use the Matrix package, be sure to load it BEFORE loading mosaic.
```

```
##
## Attaching package: 'mosaic'
```

```
## The following object is masked from 'package:Matrix':
##
##     mean
```

```
## The following objects are masked from 'package:dplyr':
##
##     count, do, tally
```

```
## The following objects are masked from 'package:stats':
##
##     binom.test, cor, cor.test, cov, fivenum, IQR, median,
##     prop.test, quantile, sd, t.test, var
```

```
## The following objects are masked from 'package:base':
##
##     max, mean, min, prod, range, sample, sum
```

Ejercicio 1

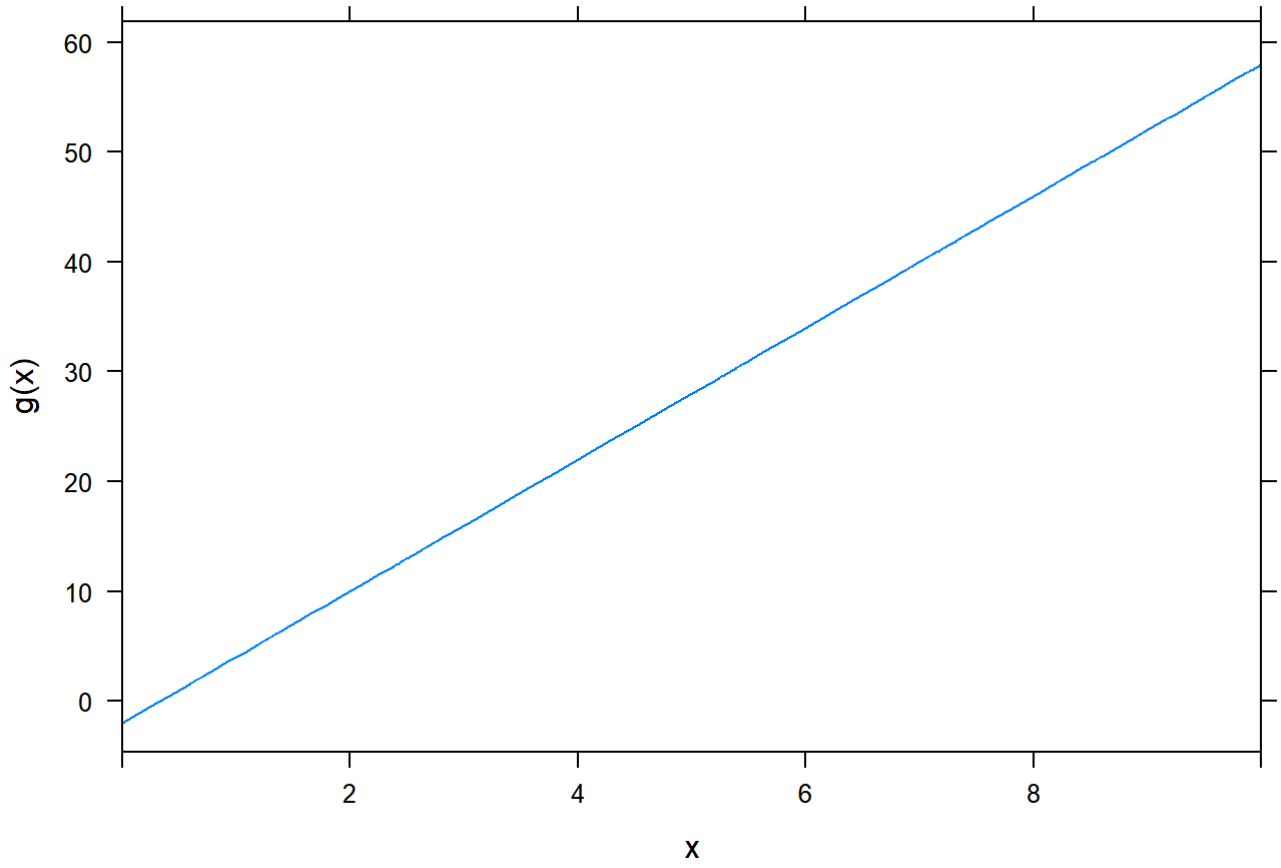
```
#Using D(), find the derivate of:
g = mosaicCalc::D(3*x^2-2*x+4 ~ x)
g
```

```
## function (x)
## 3 * (2 * x) - 2
```

```
#a)Value of the derivate if x=0:
g(0)
```

```
## [1] -2
```

```
#b)What does a graph of the derivate function look like?
plotFun(g, x.lim=range(0,10))
```




```
#B -> Positive sloping line
```

Ejercicio 2

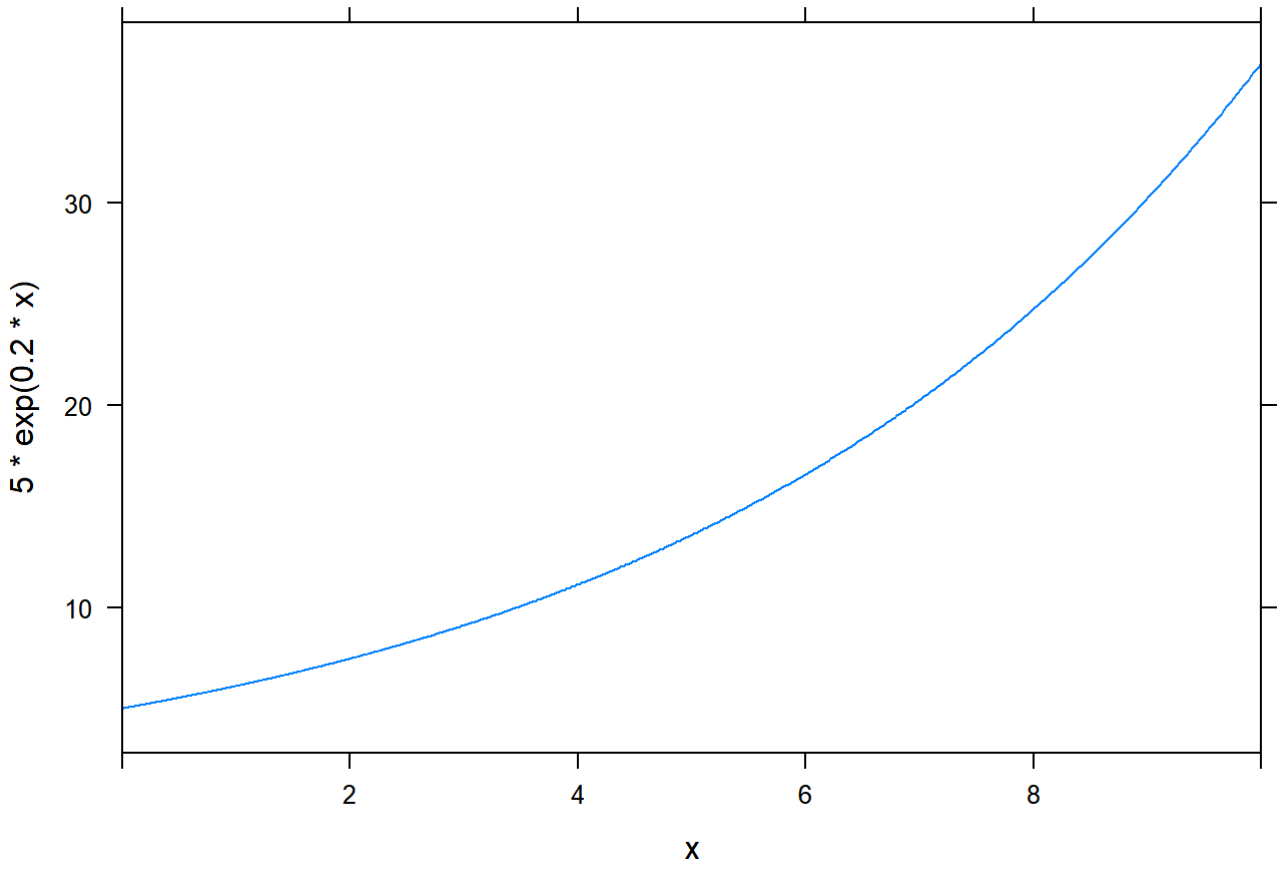
```
#Using D(), find the derivate of:
d = mosaicCalc::D(5*exp(.2*x) ~ x)
d
```

```
## function (x)
## 5 * (exp(0.2 * x) * 0.2)
```

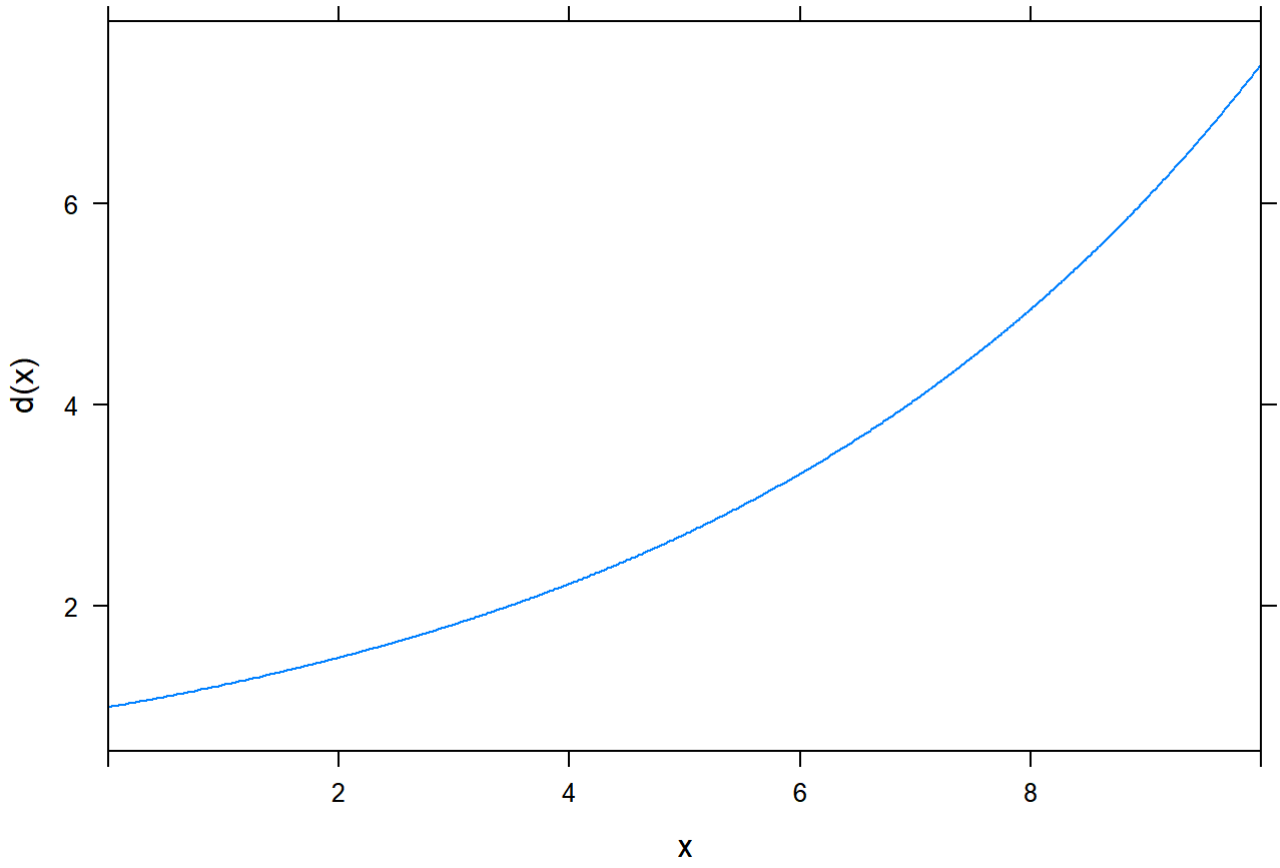
```
#a)Value of the derivate if x=0:
d(0)
```

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

```
#b)Plot out both the original expression and its derivate. How are they related at each othe
r?
plotFun(5*exp(.2*x) ~ x, x.lim=range(0,10))
```




```
plotFun(d, x.lim=range(0,10))
```



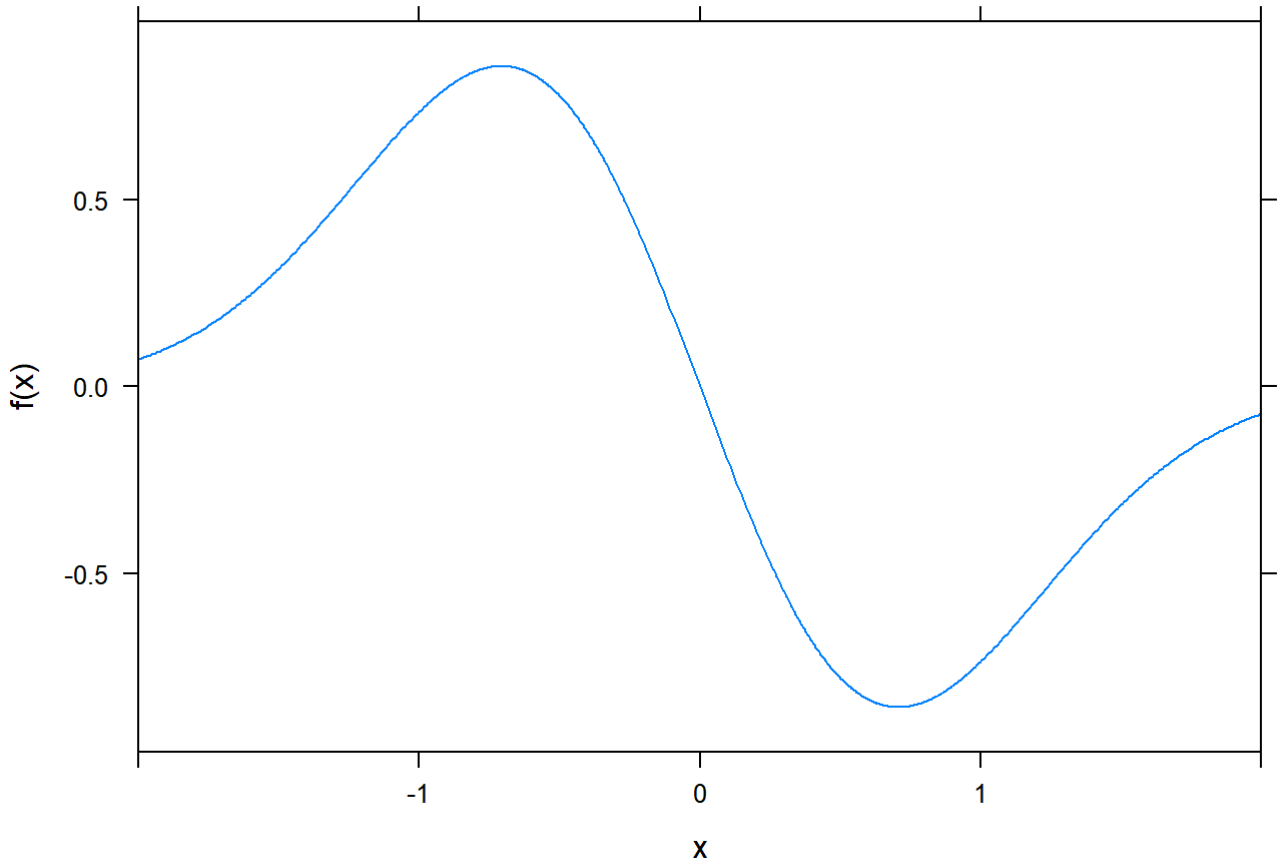
```
#B -> Same exponential shape, but different initial values.
```

Ejercicio 3

```
#Use D() to finde the derivate of e^(-(x^2))
f = mosaicCalc::D(exp(-(x^2)) ~ x)
f
```

```
## function (x)
## -(exp(-(x^2)) * (2 * x))
```

```
#Graph the derivate from x=-2 to 2
plotFun(f, x.lim=range(-2,2))
```




```
#What does the graph look like?
#C -> A positive wave followed by a negative wave.
```

Ejercicio 4

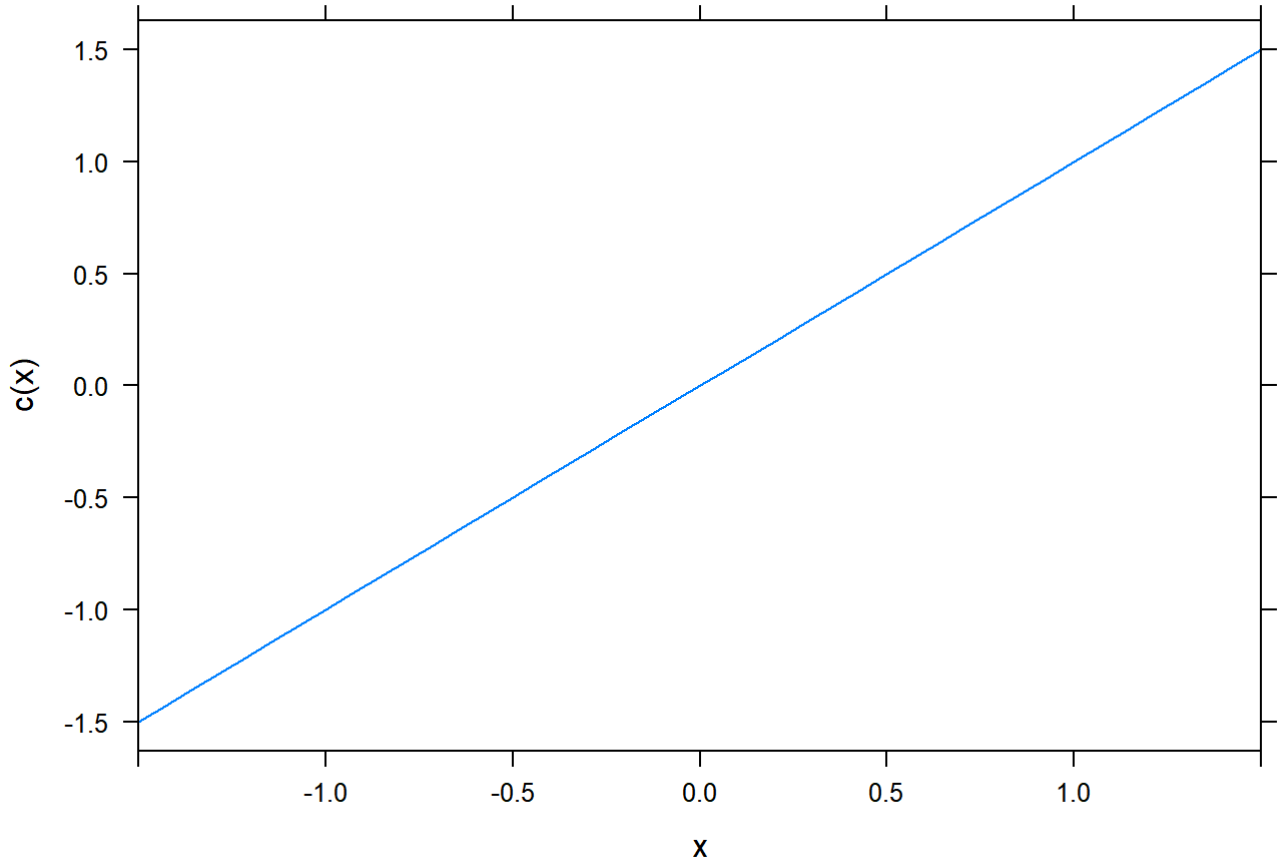
```
#What will be the value of this derivate?
c = mosaicCalc::D(fred^2 ~ ginger)
```

```
## Warning in makeFun.formula(formula, ...): Implicit variables without
## default values (dangerous!): fred
```

```
c
```

```
## function (ginger, fred)
## 0
```

```
plotFun(c)
```




```
#C -> A positive sloping lane
```

Ejercicio 5

```
#Use D() to find the 3rd derivate of:
v = mosaicCalc::D(cos(2*t) ~ t&t&t)
v
```

```
## function (t)
## sin(2 * t) * 2 * 2 * 2
```

```
#What is it?
#D -> 8sin(2t)

#What is the 4th derivate?
v1 = mosaicCalc::D(cos(2*t) ~ t&t&t&t)
v1
```

```
## function (t)
## cos(2 * t) * 2 * 2 * 2 * 2
```

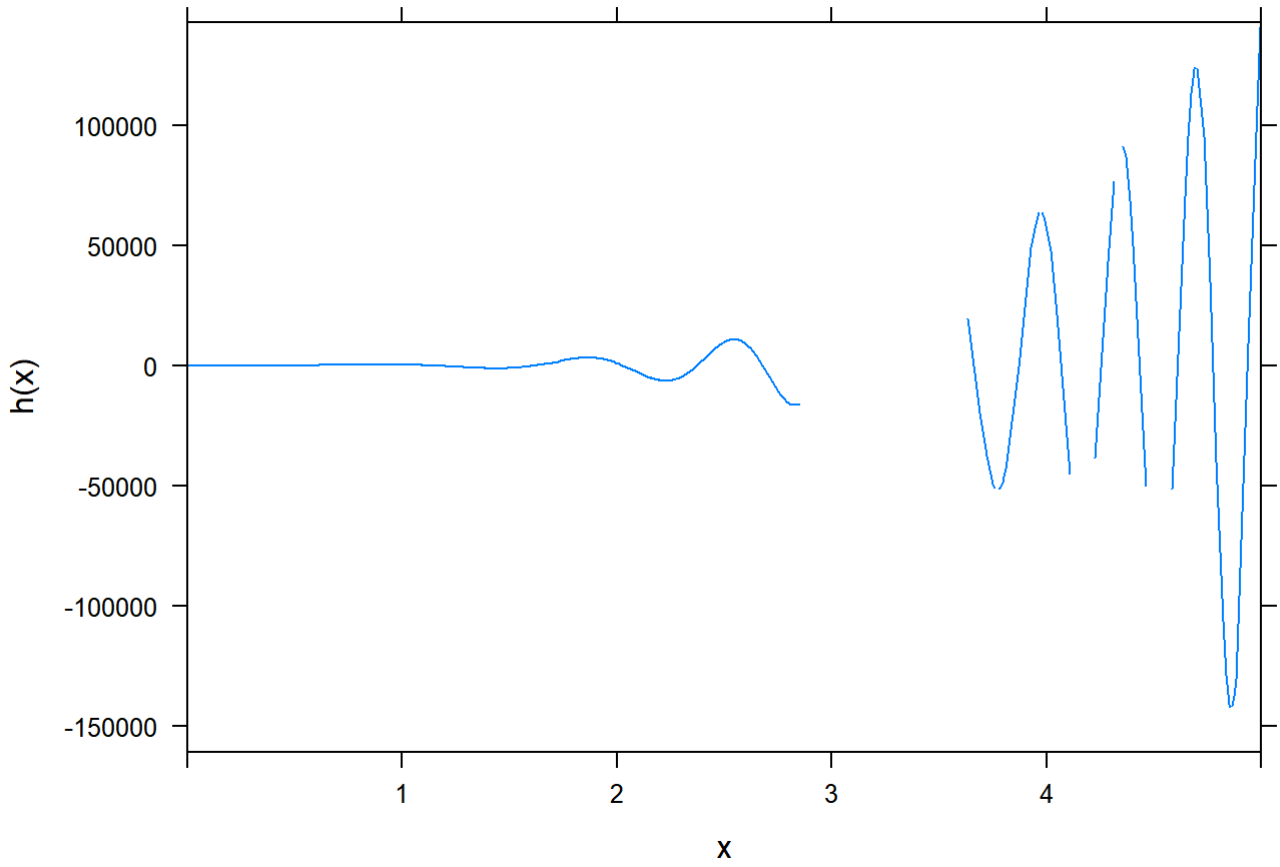
```
#E -> 16sin(2t)
```

Ejercicio 6

```
#Compute and graph the 4th derivate of:
h = mosaicCalc::D(cos(2*t^2) ~ t&t&t&t)
h
```

```
## function (t)
## -((cos(2 * t^2) * (2 * 2) - sin(2 * t^2) * (2 * (2 * t)) * (2 *
##     (2 * t))) * (2 * 2) - (sin(2 * t^2) * (2 * (2 * t)) * (2 *
##     2) + ((cos(2 * t^2) * (2 * (2 * t)) * (2 * (2 * t)) + sin(2 *
##     t^2) * (2 * 2)) * (2 * (2 * t)) + sin(2 * t^2) * (2 * (2 *
##     t)) * (2 * 2))) * (2 * (2 * t)) + (cos(2 * t^2) * (2 * 2) -
##     sin(2 * t^2) * (2 * (2 * t)) * (2 * (2 * t))) * (2 * 2) +
##     (cos(2 * t^2) * (2 * 2) - sin(2 * t^2) * (2 * (2 * t)) *
##         (2 * (2 * t))) * (2 * 2))
```

```
#What does the graph look like?
plotFun(h, x.lim = range(0,5))
```



```
#C -> A cosine whose amplitude increases and whose period decreases as t gets bigger.

#What functions appear in the complicated expresion?
#C -> cos, sin, squaring, multiplication and addition.
```

Ejercicio 7

```
#Use D() to compute several derivate functions:
m=mosaicCalc::D(x*sin(y)~x)
```

```
## Warning in makeFun.formula(formula, ...): Implicit variables without
## default values (dangerous!): y
```

```
m
```

```
## function (x, y)
## sin(y)
```

```
m1=mosaicCalc::D(x*sin(y)~y)
```

```
## Warning in makeFun.formula(formula, ...): Implicit variables without
## default values (dangerous!): x
```

```
m1
```

```
## function (y, x)
## x * cos(y)
```

```
m2=mosaicCalc::D(m(x,y)~x)
```

```
## Warning in makeFun.formula(formula, ...): Implicit variables without
## default values (dangerous!): y
```

```
m2
```

```
## function (x, y)
## 0
```

```
m3=mosaicCalc::D(m(x,y)~y)
m3
```

```
## function (x, y)
## cos((y))
```

```
#And these two mixed partials:
m4=mosaicCalc::D(x*sin(y)~x&y)
m4
```

```
## function (x, y)
## cos(y)
```

```
m5=mosaicCalc::D(x*sin(y)~y&x)
m5
```

```
## function (y, x)
## cos(y)
```

```
#The partial with respect to x and to y are identical - FALSE
m(2,3)
```

```
## [1] 0.14112
```

```
m1(2,3)
```

```
## [1] -1.248441
```

```
m(5,8)
```

```
## [1] 0.9893582
```

```
m1(5,8)
```

```
## [1] 2.269297
```

```
m(-3,2)
```

```
## [1] 0.9092974
```

```
m1(-3,2)
```

```
## [1] -1.979985
```

```
#The second partials with respect to x and to y are identical - FALSE
m2(2,3)
```

```
## [1] 0
```

```
m3(2,3)
```

```
## [1] -0.9899925
```

```
m2(5,8)
```

```
## [1] 0
```

```
m3(5,8)
```

```
## [1] -0.1455
```

```
m2(-3,2)
```

```
## [1] 0
```

```
m3(-3,2)
```

```
## [1] -0.4161468
```

```
#The two mixed partials are identical. That is, it doesnt matter whether you differentiate fi
rst with respect to x and then y, or vice versa - FALSE
m4(2,3)
```

```
## [1] -0.9899925
```

```
m5(2,3)
```

```
## [1] -0.4161468
```

```
m4(5,8)
```

```
## [1] -0.1455
```

```
m5(5,8)
```

```
## [1] 0.2836622
```

```
m4(-3,2)
```

```
## [1] -0.4161468
```

```
m5(-3,2)
```

```
## [1] -0.9899925
```