Calculo fundamentos

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7/11/2017

```
# Cargamos los dos paquetes utilizados en clase para el calculo:
library(mosaicCalc)
```

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

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

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

```
library(mosaic)
```

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

```
## Warning: package 'dplyr' was built under R version 3.4.2
```

```
##
## 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 this.
##
## 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
```

1. EJERCICIO 1:

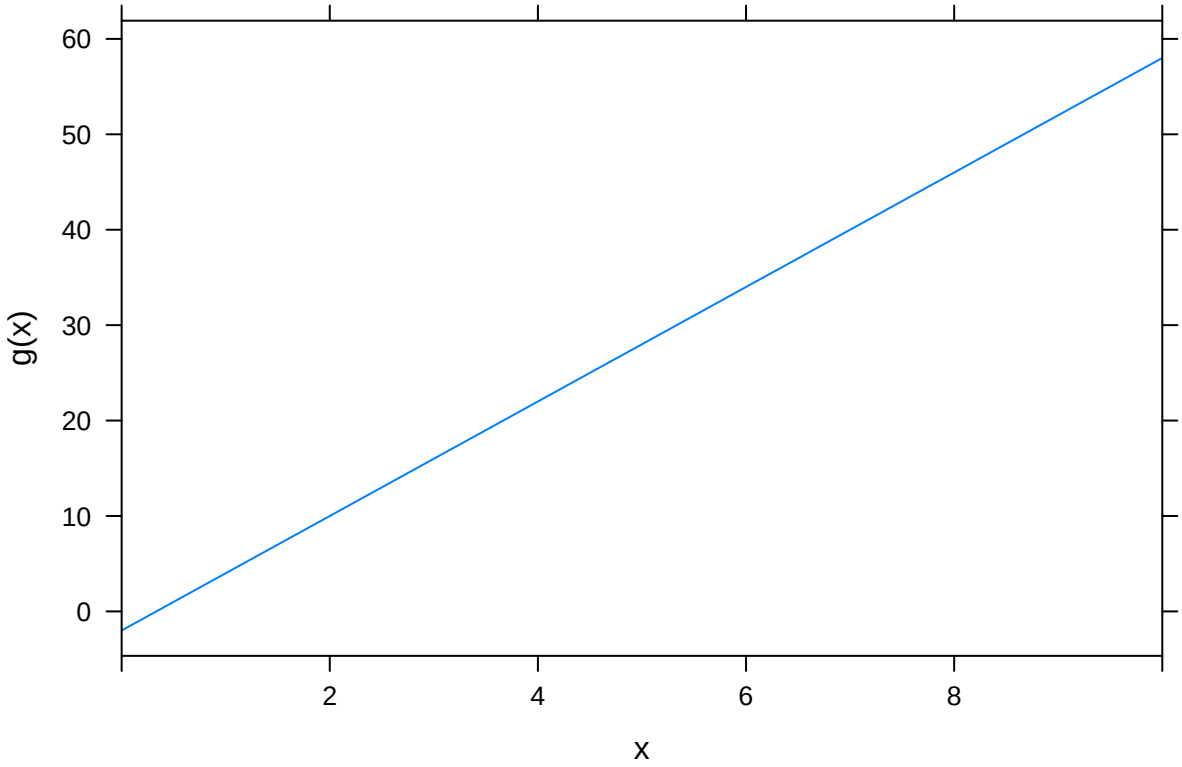
```
#Using D(), find the derivate of:
g = mosaicCalc::D(3*x^2-2*x+4 ~ x)
g
```

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

```
# a) Value derivative x=0:
g(0)
```

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

```
# b) Graph?
plotFun(g, x.lim=range(0,10))
```




```
# Solution: B) Positive sloping line.
```

EJERCICIO 2:

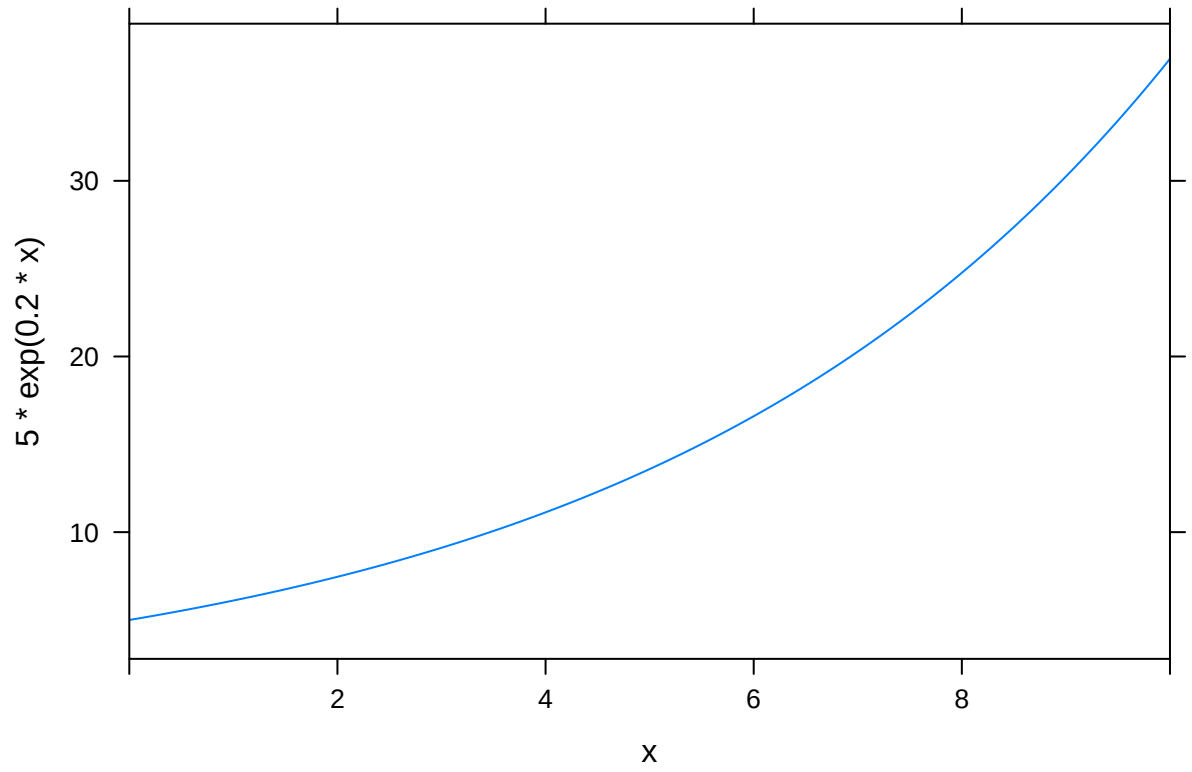
```
#Using D(), find the derivate of:
f = mosaicCalc::D(5*exp(.2*x) ~ x)
f
```

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

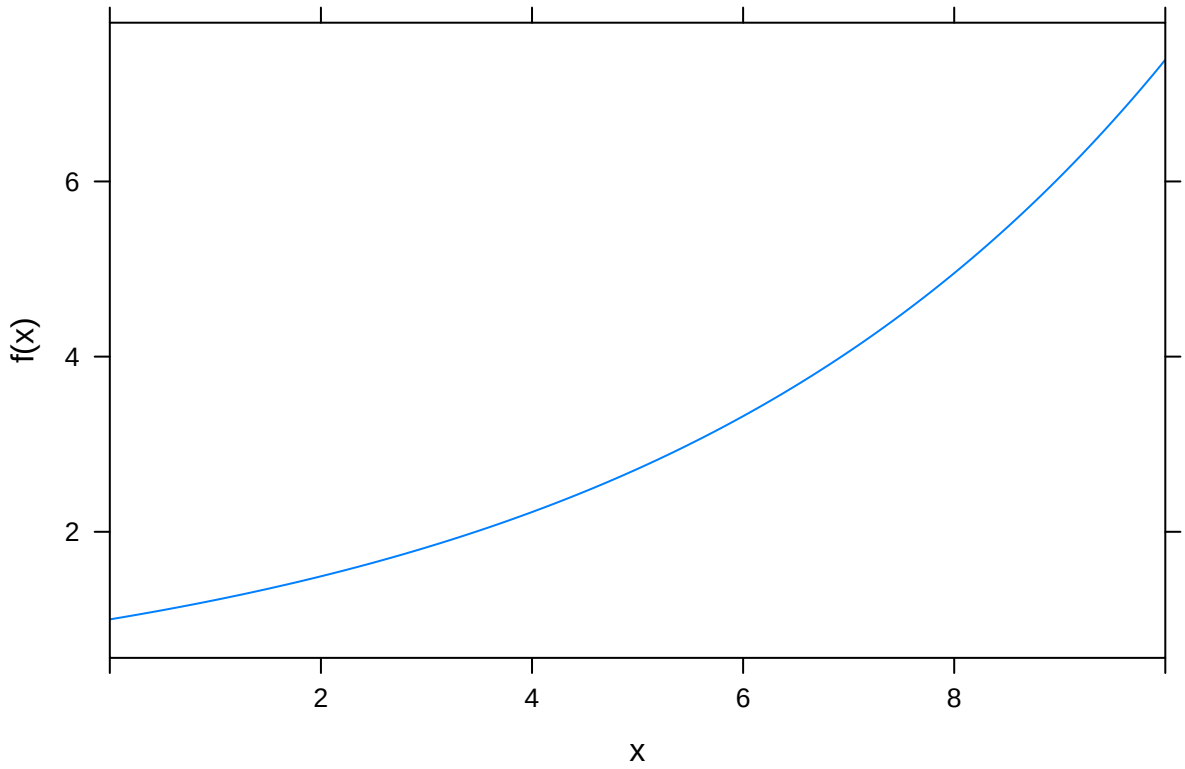
```
# a) Value when x=0:
f(0)
```

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

```
# b) Relation with previous graph:
plotFun(5*exp(.2*x) ~ x, x.lim=range(0,10))
```




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



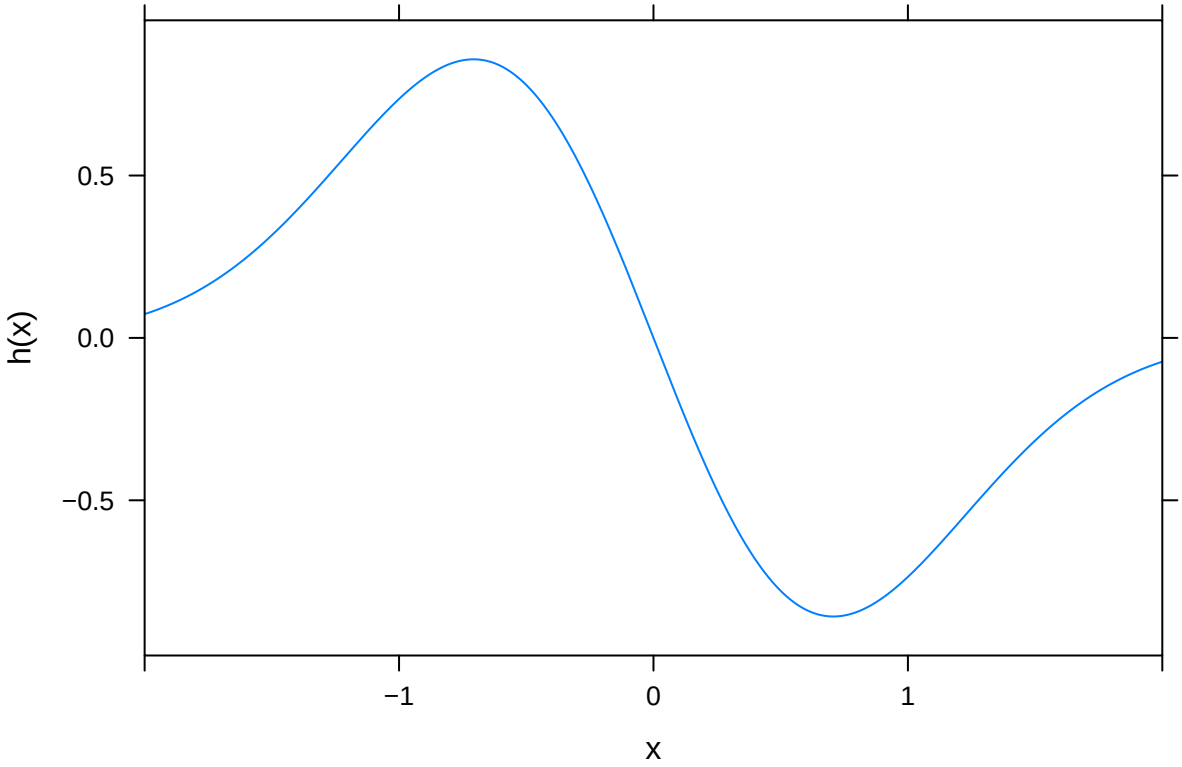

```
# Solution: B) Same exponential slope but different initial values.
```

EJERCICIO 3:

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

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

```
# Graph from -2 to 2:
plotFun(h, x.lim=range(-2,2))
```




```
# Solution :  B) A positive wave followed of a negative wave.
```

EJERCICIO 4:

```
# Which is the value of the derivative of D(fred^2~Ginger)?
r = mosaicCalc::D(fred^2 ~ ginger)
```

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

```
r
```

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

```
# Solution: A) 0 everywhere
```

EJERCICIO 5:

```
# Find 3rd derivtive of cos(2*t):
# using the ~&t&t notation:
l = mosaicCalc::D(cos(2*t) ~ t&t&t)
l
```

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

```
# Solution: D) 8 sin(2t)
l2= mosaicCalc::D(cos(2*t) ~ t&t&t&t)
l2
```

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

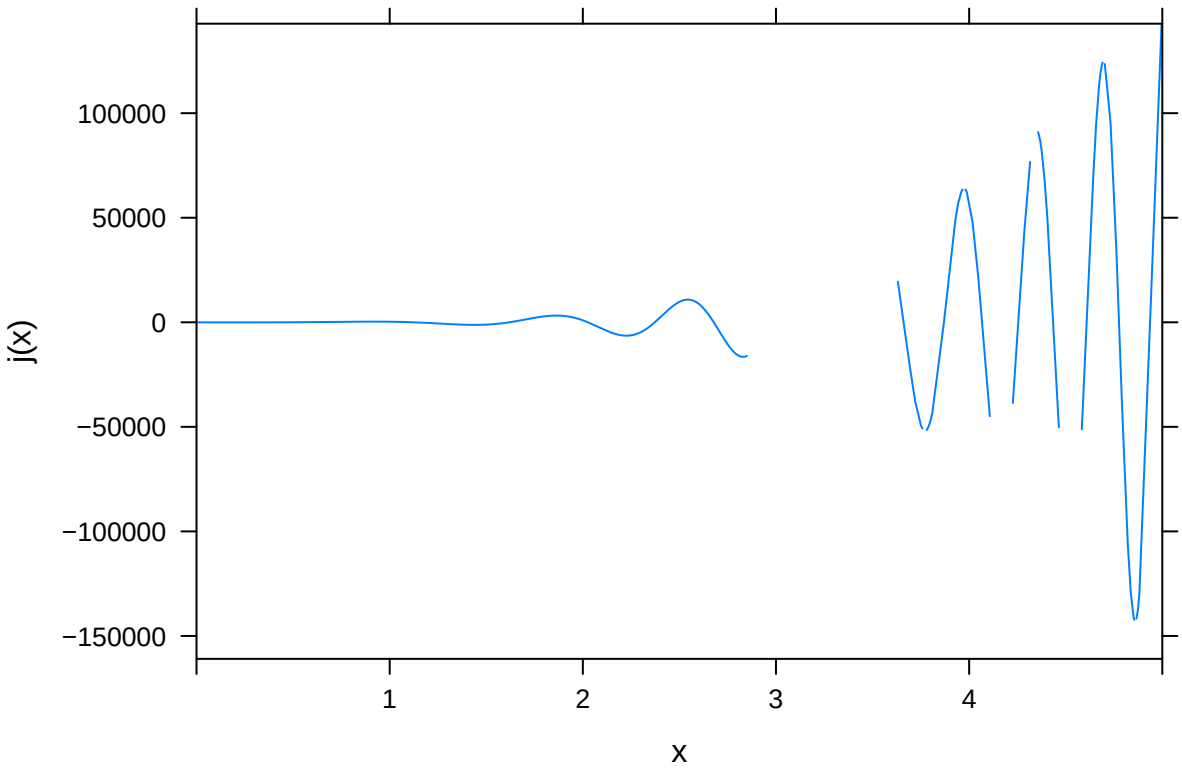
```
# Solution: E) 16 cos(2t)
```

EJERCICIO 6:

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

```
## 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))
```

```
plotFun(j, x.lim = range(0,5))
```




```
# Solution1 : C) A cosine whose amplitude increases and whose period decreases as t gets bigger.
# Solution1 : C) cos, sin, squaring, multiplication and addition.
```

EJERCICIO 7:

```
# Compute the 1st derivative with respect to x and y and the 2nd derivative with respect to x and y and
# 1st and 2nd derivtives:
k=mosaicCalc::D(x*sin(y)~x)
```

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

```
k
```

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

```
k1=mosaicCalc::D(x*sin(y)~y)
```

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

```
k1
```

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

```
k2=mosaicCalc::D(k(x,y)~x)
```

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

```
k2
```

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

```
k3=mosaicCalc::D(k(x,y)~y)
k3
```

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

```
# mixed partials:
k4=mosaicCalc::D(x*sin(y)~x&y)
k4
```

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

```
k5=mosaicCalc::D(x*sin(y)~y&x)
k5
```

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

```
# Pick any two values and answer:
# 1) Partial with respect to x and y are identical
k(2,4)
```

```
## [1] -0.7568025
```

```
k1(2,4)
```

```
## [1] -1.664587
```

```
k(6,8)
```

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

```
k1(6,8)
```

```
## [1] 7.681362
```

```
# Solution : FALSE
```

```
# 2) The 2nd partial with respect x and y are identical
k2(4,5)
```

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

```
k3(4,5)
```

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

```
k2(5,6)
```

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

```
k3(5,6)
```

```
## [1] 0.9601703
```

```
# Solution : FALSE
```

```
# The two mixed partials are identical; it doesn't matters the order
k4(3,4)
```

```
## [1] -0.6536436
```

```
k5(3,4)
```

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

```
k4(7,9)
```

```
## [1] -0.9111303
```

```
k5(7,9)
```

```
## [1] 0.7539023
```

```
# Solution : FALSE
```