Assignment 13

Ben Arancibia

November 23, 2014

Question 1

Write a program to compute the derivative of $f(x) = x^3 + 2x^2$. The function should take in a value of x and return back an approximation to the derivate of f(x) evaluated at the value.

```
invisible(library(mosaic))
```

```
## Loading required package: car
## Loading required package: dplyr
##
## Attaching package: 'dplyr'
##
## The following object is masked from 'package:stats':
##
##     filter
##
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
##
## Loading required package: lattice
## Loading required package: ggplot2
##
## Attaching package: 'mosaic'
##
## The following objects are masked from 'package:dplyr':
##
##     count, do, tally
##
## The following object is masked from 'package:car':
##
##     logit
##
## The following objects are masked from 'package:stats':
##
##     binom.test, cor, cov, D, fivenum, IQR, median, prop.test, sd,
##     t.test, var
##
## The following objects are masked from 'package:base':
##
##     max, mean, min, prod, range, sample, sum
```

```
f1 <- D(x^3 + 2*x^2 ~ x)

#as example can solve for any value
f1(x=2)
```

```
## [1] 20
```

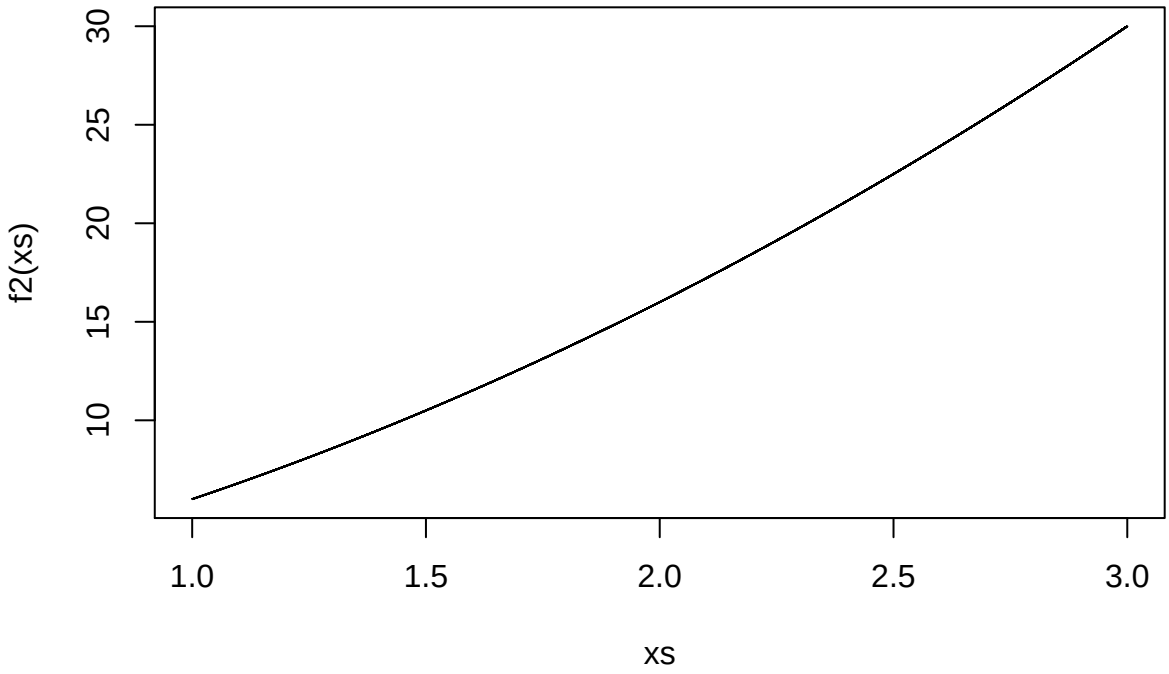
Question 2

Now write a program to compute the area under the curve for the function $2X^2 + 4x$ in the range $x = [1,3]$.

```
library(zoo)
```

```
##
## Attaching package: 'zoo'
##
## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric
```

```
f2 <- function(x) (2*x^2 + 4*x)
xs <- seq(1, 3, by = 0.000006)
plot(xs, f2(xs), type= "l")
```




```
x <- 1:3
y <- 2*x^2 + 4*x
id <- order(x)
AUC <- sum(diff(x[id])*rollmean(y[id],2))

AUC
```

```
## [1] 34
```

Question 3

Integration by parts to solve for

$$\int sin(x)cos(x)\,dx$$

$$= 1/2sin2x$$

$$\int 1/2sin2x\,dx$$

final answer:

$$-1/2cos^2(x) + C$$

Integration by parts to solve for

$$\int x^2e^x\,dx$$

$$udv = uv - integral(vdu)$$

u = xˆ2 du = 2x dx dv = eˆx dx v = eˆx

$$x^2 * e^x - integral(2x * e^x dx)$$

We have to do it again

u = x du = dx dv = eˆx dx v = eˆx

$$x^2 * e^x - 2[x * e^x - integral(e^x dx)]$$

Simplify:

$$x^2 * e^x - 2x * e^x + 2 * integral(e^x dx)$$

$$x^2 * e^x - 2x * e^x + 2 * e^x + C$$

Factor out: eˆx

Final Answer:

$$e^x[x^2 - 2x + 2] + C$$

What is the derivative of

$$xcos(x)$$

Use the product rule.

$$(f * g) = f' * g + g' * f$$

f' = 1 g'=-sin(x)

$$1 * cos(x) - xsin(x)$$

Final Answer:

$$cos(x) - xsin(x)$$

What is the derivative of e^x4

e^x4 * d/dx (x^4)

Final Answer: 4x^3 * e^x4