# 732A90 - Lab 1 - jorva845

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*24 January 2020*

#Q1: Be careful when comparint

*Consider the following two R code snippets*

```
x1 <- 1/3; x2 <- 1/4
if(x1-x2==1/12){
  print("Subtraction is correct")
}else{
  print("Subtraction is wrong")
}
```

```
## [1] "Subtraction is wrong"
```

```
x3 <- 1; x4 <- 1/2
if(x3-x4==1/2){
  print("Subtraction is correct")
}else{
  print("Subtraction is wrong")
}
```

```
## [1] "Subtraction is correct"
```

##1.

*Check the results of the snippets. Comment what is going on.*

So if we would do these calculations manually we would expect both calculations to return the correct answer. Yet the first one fails. I suspect that it has to do with the fact that 1/3 is irrational and R creates rounding errors when perfroming these calculations. Let's explore:

```
sprintf("%.20f", (x1-x2))
```

```
## [1] "0.08333333333333331483"
```

```
sprintf("%.20f", 1/12)
```

```
## [1] "0.08333333333333332871"
```

As becomes clear the two values in the first computation do indeed not equal to each other.

##2.

*If there are any problems, suggest improvements.*

The problem lies in rounding errors, so this might be solved by using less decimal points. Let's try.

```
x1 <- 1/3; x2 <- 1/4
if(round((x1-x2), digits = 15) == round((1/12), digits = 15)){
  print("Subtraction is correct")
}else{
  print("Subtraction is wrong")
}
```

```
## [1] "Subtraction is correct"
```

This seems to work.

#Q2: Derivative

*From the defintion of a derivative a popular way of computing it at a point $x$ is to use a small $\epsilon$ and the formula*

$$f'(x) = \frac{f(x+\epsilon) - f(x)}{\epsilon}$$

##1.

*Write your own R function to calculate the derivative of f(x) = x in this way with* $\epsilon = 10^{15}$