Computer Lab 1

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Question 1

1

It is not possible to represent exact 1/3 and 1/12 in binary. As a result it is rounded towards nearest computer float and in R its equal to 0.33333333333333331 and 0.083333333333333329 respectively. In the first snippet code, the result is "Subtraction is wrong", but the second snippet code the result is "Subtraction is correct". The only numbers that represent exactly in r , are integers and fractions by power of 2 denominator. Hence all other numbers are rounded to 53 binary digits accuracy. When ever floating point operations are done , we should assume that there will be numeric error. 1/3 and 1/12 are repeating decimals that are rounded in R.

2

Instead of writing `if(x1 - x2 == 1/12)` it should be written `if(isTRUE(all.equal(x1-x2,1/12)))`. In this case this equation will return TRUE. We can use `all.equal` function , or we can use `all.equal.numeric` function too.

Question 4

1

is it he case when n = k = 0 or n > 0, k = 0 ?

```
n <- 1000
k <- 800
prod(1:n) / (prod(1:k) * prod(1:(n-k)))
```

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

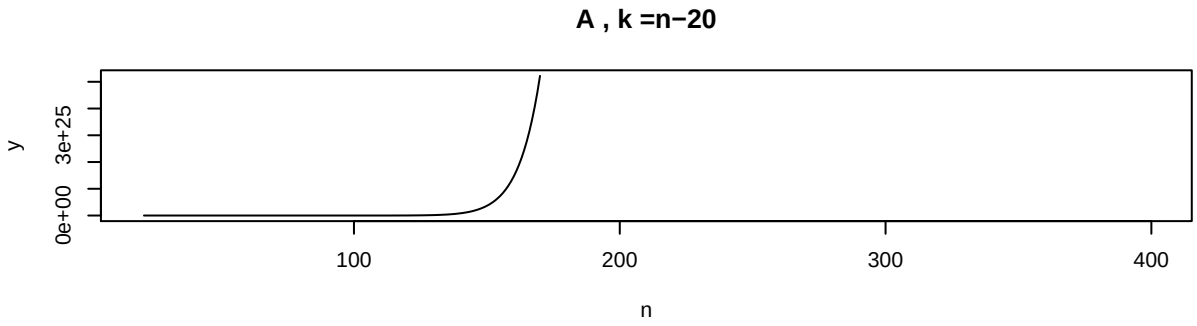
```
prod((k+1):n) / prod(1:(n-k))
```

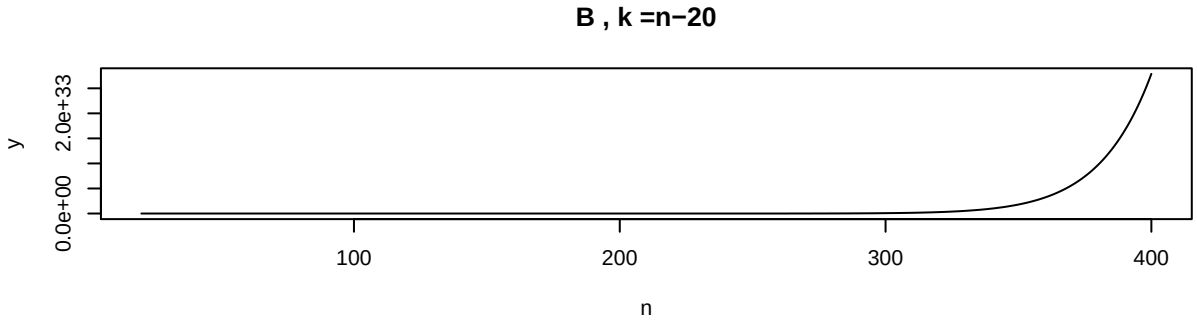
```
## [1] NaN
```

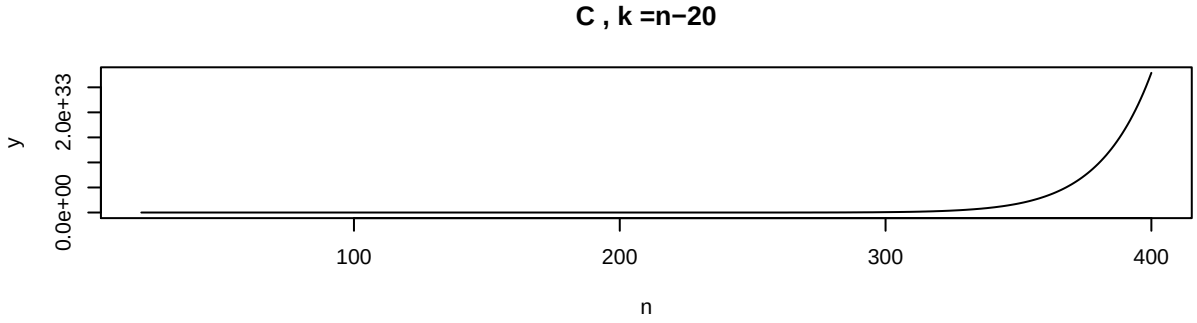
```
prod(((k+1):n) / (1:(n-k)))
```

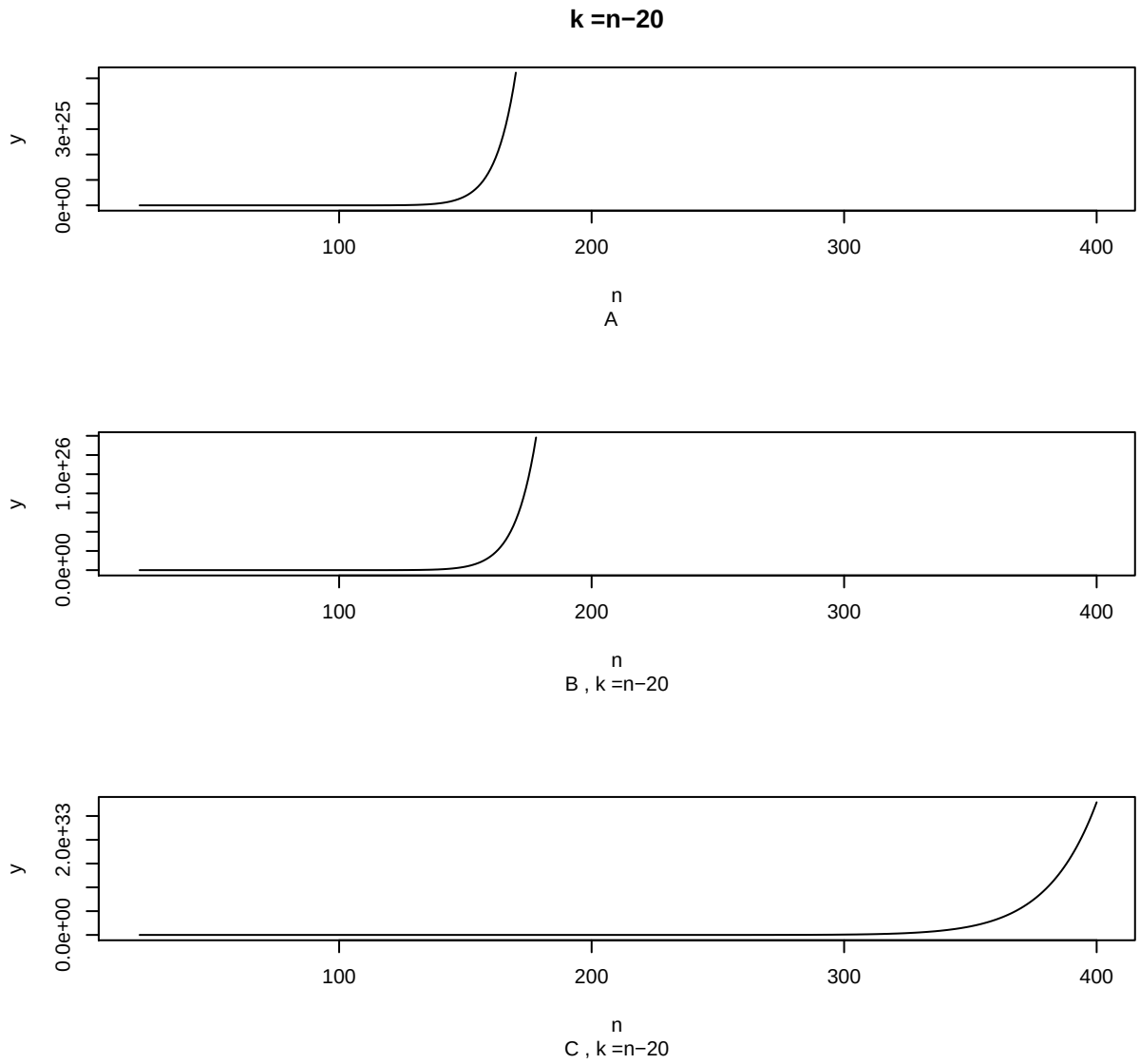
```
## [1] 6.617156e+215
```

2


A , k =n−20
y
0e+00
3e+25
100
200
300
400
n


B , k =n−20
y
0.0e+00
2.0e+33
100
200
300
400
n


C , k =n−20
y
0.0e+00
2.0e+33
100
200
300
400
n



3

expression A and B, because with large numbers method prod() will overflow.

In expression A we calculate product of vector from 1 to n and later divide it by other products with smaller vectors. However in this case first operation (prod(1:n)) will overflow (= Inf) and other operations wont matter as the result will be Inf or Nan (if denominator will be also Inf).

In expression B overflow will depend on k, if k is close to n it wont overflow.

In expression C, as first vectors are divided, the final vector for product will have smaller values and that is why prod() method wont overflow.