```
from mpmath import *
import math
```

# Exercise 1

## part a)

```
result1=[]
result2=[]
for i in range(1,15):
  value=10**(-i)
  print(value)

  vv1=(1-sec(value))/(tan(value)**2)
  result1.append(vv1)

  vv2=(-1)/(1+sec(value))
  result2.append(vv2)
```

```
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
1e-10
1e-11
1e-12
1e-13
1e-14
```

```
result1
```

```
[mpf('-0.49874791371143462'),
 mpf('-0.49998749979095553'),
 mpf('-0.49999987501428939'),
 mpf('-0.49999999362793118'),
 mpf('-0.50000004133685205'),
 mpf('-0.50004445029083722'),
 mpf('-0.51070259132756868'),
 mpf('0.0'),
 mpf('0.0'),
 mpf('0.0'),

 mpf('0.0'),
 mpf('0.0'),
 mpf('0.0'),
 mpf('0.0')]
```

```
result2
```

```
[mpf('-0.49874791371142879'),
 mpf('-0.49998749979166379'),
 mpf('-0.49999987499997917'),
 mpf('-0.49999999875000001'),
 mpf('-0.4999999999875'),
 mpf('-0.49999999999987499'),
 mpf('-0.49999999999999867'),
 mpf('-0.5'),
 mpf('-0.5'),
 mpf('-0.5'),
 mpf('-0.5'),
 mpf('-0.5'),
 mpf('-0.5'),
 mpf('-0.5')]
```

## part b)

```
result1=[]
result2=[]
for i in range(1,15):
  value=10**(-i)
  print(value)

  vv1=(1-(1-value)**3)/(value)
  result1.append(vv1)

  vv2=(3-3*value+value**2)
  result2.append(vv2)
```

```
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
1e-10
1e-11
1e-12
1e-13
1e-14
```

```
result1
```

```
[2.709999999999999,
 2.9700999999999977,

 2.997000999999999,
 2.9997000100001614,
 2.9999700000837843,
 2.99999700004161,
 2.999999698660716,
 2.999999981767587,
 2.9999999151542056,
 3.000000248221113,
 3.000000248221113,
 2.9999336348396355,
 3.000932835561798,
 2.9976021664879227]
```

```
result2
```

```
     [2.71,
      2.9701000000000004,
      2.997001,
      2.9997000099999998,
      2.9999700001,
      2.999997000001,
      2.9999997000000103,
      2.99999997,
      2.999999997,
      2.9999999997,
      2.99999999997,
      2.999999999997,
      2.9999999999997,
      2.99999999999997]
```

# Exercise 2

## part a)

```
solution=[]
for i in range(1,10):
  x=10**(-i)
  print(x)

  sol=(tan(x)-x)/(x**3)
  solution.append(sol)
```

```
     0.1
     0.01
     0.001
     0.0001
     1e-05
     1e-06
     1e-07
     1e-08
     1e-09
```

```
solution
```

```
     [mpf('0.33467208545054355'),
      mpf('0.33334666720702394'),
      mpf('0.33333346673158903'),
      mpf('0.33333333651890806'),
      mpf('0.3333328757329847'),
      mpf('0.33330746474456724'),
      mpf('0.3308722450212111'),
      mpf('0.0'),
      mpf('0.0')]
```

part b)

```
solution=[]
for i in range(1,14):
  x=10**(-i)
  print(x)

  sol=(math.exp(x)+cos(x)-sin(x)-2)
  solution.append(sol)
```

```
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
1e-10
1e-11
1e-12
1e-13
```

```
solution
```

```
[mpf('0.00034166670684543377'),
 mpf('3.3416666678220963e-7'),
 mpf('3.3341684968490881e-10'),
 mpf('3.3351099659739702e-13'),
 mpf('4.4408920985006262e-16'),
 mpf('0.0'),
 mpf('-2.2204460492503131e-16'),
 mpf('0.0'),
 mpf('0.0'),
 mpf('0.0'),
 mpf('0.0'),
 mpf('0.0'),
 mpf('0.0')]
```

# Exercise 3

```
from decimal import Decimal
from decimal import *
from decimal import *
getcontext().prec = 33

a=Decimal(-123456789987654321)
b=Decimal(123)
```

```
a**2
```

```
    Decimal('152415789666209420210333789971041')
```

```
b**2
```

```
    Decimal('15129')
```

```
a**2+b**2
```

```
    Decimal('152415789666209420210333789986170')
```

```
(a**2+b**2)**(Decimal(1/2))
```

```
    Decimal('123456789987654321.0000000000006127')
```

```
a+(a**2+b**2)**(Decimal(1/2))
```

```
    Decimal('6.127E-13')
```

## With normal double precision

```
a = float(-123456789987654321)
b = float(123)

solution = a + math.sqrt((a**2)+(b**2))
f'{solution:.4}'
```

```
    '0.0'
```

```
f'{a:.33}'
```

```
    '-123456789987654320.0'
```

✓ 0 s completado a las 12:18 ● ×