T.D. n°9 : Correction

Partie I

1)
```
n=int(input('n = '))
s=0
for k in range(1,n+1):
   s=s+1/(1+k)
print(s)
```

Ou :
```
x=[1/(k+1) for k in range(1,n+1)]
s=np.sum(x)
print(s)
```

Pour n = 10, on trouve : 2.0198773

2)a)
```
def suite(n):
   u=2
   for k in range(2,n+1):
      u=u-np.log(u)+1
   return u
```

On trouve suite(3) = 2,4709…

```
n=1;u=2
while np.abs(u-np.exp(1))>10**-4:
   n=n+1
   u=u-np.log(u)+1
print(n)
```

On trouve : n = 20

```
u=2
U=[2]
for i in range(2,16):
   u=u-np.log(u)+1
   U.append(u)
N=range(1,16)
plt.plot(N,U,"*")
```

3)
```
u_a=1;u_b=-2
for i in range(9):
   temp=u_b-3*u_a
   u_a=u_b
   u_b=temp
print(u_b)
```

On trouve : $u_{10} = 160$

	u_a	u_b	temp
Au début du tour de boucle	u_n	u_{n+1}	
temp=u_b-3*u_a	u_n	u_{n+1}	u_{n+2}
u_a=u_b	u_{n+1}	u_{n+1}	u_{n+2}
u_b=temp	u_{n+1}	u_{n+2}	u_{n+2}
A la fin du tour de boucle	u_{n+1}	u_{n+2}	

for i in range(9) : 9 tours de boucle   u_a : $u_0 \longrightarrow u_9$ u_b : $u_1 \longrightarrow u_{10}$ donc : print(u_b)

4)
```
def f(x):
   return np.exp(x)+3*x

X=np.linspace(0,1,100)
Y=f(X)
plt.plot(X,Y)
```

5)
```
def f(x):
        return np.exp(x)+3*x
a=0;b=1
while b-a>10**-4 :
   c=(a+b)/2
   if f(c)>3:
      b=c
   else:
      a=c
print(a)
```
On trouve : 0,4677…

6)
```
def extraitliste(L,x):
   M=[]
   for y in L:
      if y<=x:
         M.append(y)
   return M
```

Ou :
```
def extraitliste2(L,x):
   M=[y for y in L if y<=x]
   return M
```

7)
```
def valeurpropre(A,x):
   n=len(A)
   r=al.matrix_rank(A-x*np.eye(n,n))
   if r<n:
      return True
   else:
      return False
```

8)
```
if rd.random()<2/5:
    boule='R'
else:
    boule='V'
print(boule)
```

9) On voit que : $X \longrightarrow \mathcal{B}(10, 1/3)$.
$\forall k \in \{0, \dots, 10\}$, $Y_{(X = k)} \longrightarrow \mathcal{U}([[0;k]])$
```
x=rd.binomial(10,1/3);
y=rd.randint(0,x+1);
print('x =',x)
print('y = ',y)
```

10) X = nombre d'échecs avant le premier succès = loi géométrique – 1
```
x=0
while rd.random()>1/4:
   x=x+1
print(x)
```
Ou :
```
x=rd.geometric(1/4)-1
print(x)
```
11) a) $2\times0-1 = -1$ $2\times1-1 = 1$ donc $Y(\Omega) = \{-1,1\}$

$P(Y = -1) = P(2X - 1 = -1) = P(X = 0) = \frac{1}{2}$ $P(Y = 1) = P(2X - 1 = 1) = P(X = 1) = \frac{1}{2}$

Y suit la loi uniforme sur $\{-1;1\}$

b)
```
x=rd.binomial(1,1/2)
y=2*x-1
print(y)
```

12) $Y = \ln(X) \Leftrightarrow X = e^Y$
```
y=rd.exponential(1/2)
x=np.exp(y)
print(x);
```

13)
```
x = rd.normal(0,1,1000)
print('Moyenne : ',np.mean(x))
print('Médiane : ',np.median(x))
print('Minimum : ',np.min(x))
print('Maximum : ',np.max(x))
print('Variance :',np.var(x))
print('Exart-type : ',np.std(x))
y=[-3,-2,-1,0,1,2,3]    #Ou : y=range(-3,4,1)
plt.hist(x,y);plt.show()
```