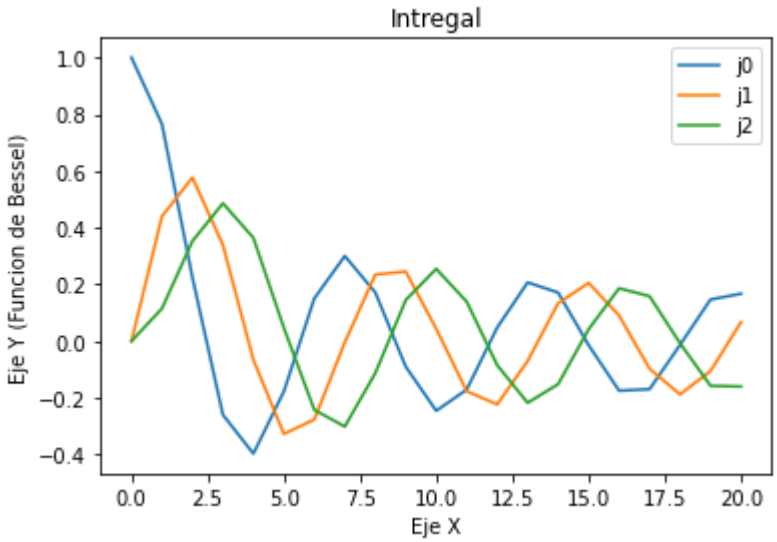
+ Code + Text

```
import math
from math import pi, cos, sin,sqrt
import numpy
import matplotlib.pyplot as plt
N=1000
a=0
b=pi
h=((b-a)/N)

def f(m, x, tetha):
    return (cos((m*tetha)-x*(sin(tetha))))

def J(m, x):
  cont=0

  fxa=f(m,x,a)
  fxb=f(m,x,b)
  for i in range(2,N,2):
      t=a+(h*i)
      cont=(f(m,x,t))+cont
  Int=0
  cont2=0
  for i in range(1,N,2):
      t=a+(h*i)
      cont2=(f(m,x,t)+cont2)
  Int=(h/(3*pi))*(fxa+fxb+(cont*2)+(cont2*4))
  return Int

j0=[None]*21
j1=[None]*21
j2=[None]*21
X=[None]*21

for x in range(0,21):
  j0[x]=J(0,x)
  j1[x]=J(1,x)
  j2[x]=J(2,x)
  X[x]=x

print("Valor j0",j0,"\n")
print("Valor j1",j1,"\n")
print("Valor j2",j2,"\n")
print("Valor x",X,"\n")
plt.title("Intregal")
plt.xlabel("Eje X")
plt.ylabel("Eje Y (Funcion de Bessel)")
plt.plot(X,j0,label="j0")
plt.plot(X,j1,label="j1")
plt.plot(X,j2,label="j2")
plt.legend()
```

```
plt.show()
```

```
Valor j0 [1.0000000000000002, 0.7651976865579666, 0.2238907791412356, -0.26005195490193
Valor j1 [-1.909583602355269e-17, 0.44005058574493316, 0.5767248077568733, 0.339058958
Valor j2 [-2.4794980883295165e-17, 0.11490348493190047, 0.35283402861563806, 0.486091266
Valor x [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20]
```




```
def Inten(lam,r):
    k=(2*pi/lam)
    F=((J(1,k*r))/(k*r))**2
    return F

L=0.5
I0=1
n=100
l=0.02

I=numpy.empty([n,n],numpy.float)
for i in range(n):
    y=l*(i-n/2)
    for j in range(n):
        x=l*(j-n/2)
        r=sqrt((x**2)+(y**2))

        if r <=0.001:
            I[i,j]= 0.5
        else:
            I[i,j] = Inten(L,r)

plt.imshow(I,vmax=0.01,cmap='hot')
plt.title("Patron de difraccion")
plt.xlabel("Eje x")
```

```
    plt.ylabel("Eje y")
    plt.xlim(0,100)
    plt.ylim(0,100)
    plt.show()
```