5.4

May 27, 2020

[1]:
```
from google.colab import drive
drive.mount('/content/gdrive')
import sys
```

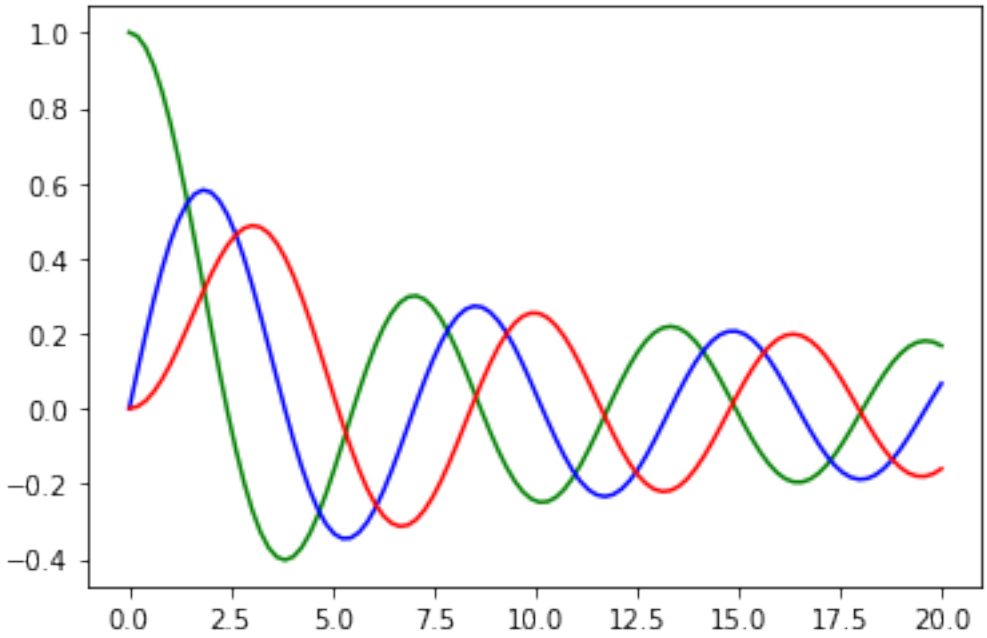
```
Drive already mounted at /content/gdrive; to attempt to forcibly remount, call
drive.mount("/content/gdrive", force_remount=True).
```

1 Ejercicio 5.4: El límite de difracción de un telescopio

[0]:
```
from numpy import loadtxt, sum, array, linspace, exp, arange, pi, cos, sin,␣
 ↪sqrt, empty, log
from math import factorial, tanh, cosh
from pylab import plot, show, xlabel, ylabel, imshow, hot, xlim, ylim, gray
```

[3]:
```
#parte a
def J(m, x):
    def f(m, x, theta):
        return cos(m*theta - x* sin(theta))

    N = 1000
    a = 0
    b = pi
    h = (b - a) / N

    oddSum = 0
    for k in range(1, N, 2):
        oddSum += f(m, x, a + k*h)

    evenSum = 0
    for k in range(1, N, 2):
        evenSum += f(m, x, a + k*h)

    return 1 / pi * 1 / 3 * h * (f(m, x, a) + f(m, x, b) + 4 * oddSum + 2 *␣
 ↪evenSum)

# Plot J0, J1, J2
```

```
xpoints = linspace(0, 20, 100)
J0 = []    # matrices vacias
J1 = []
J2 = []
for x in xpoints:
     J0.append(J(0, x))
     J1.append(J(1, x))
     J2.append(J(2, x))

plot(xpoints, J0, "g")
plot(xpoints, J1, "b")
plot(xpoints, J2, "r")
show()
```



[4]:
```
def r(x, y):
     return sqrt(x**2 + y**2)

def I(r):
     if (r == 0):
         return 1/4

     Lambda = 0.5  # en micrómetros
     kr = 2 * pi / Lambda * r
     return (J(1,kr)/ kr)**2

side = 2          # longitud en micrómetros
```

```
points = 200      # número de puntos de cuadrícula en cada dirección
spacing = side/points

# Calculamos la posicion del centro
xCenter = side/2
yCenter = side/2

# Hacer una matriz vacía para almacenar valores
intensities = empty([points, points], float)

#  Calculamos  los valores en la matriz
for i in range(points):
     y = spacing * i
     for j in range(points):
         x = spacing * j
         dist = r(x - xCenter, y - yCenter)
         intensities[i, j] = I(dist)

imshow(intensities, origin="lower", extent=[0,side,0,side], vmax=0.01)
hot()
show()
```