Homework 7.2

February 26, 2024

[54]:
```
import numpy as np
from numpy.linalg import inv
import matplotlib.pyplot as plt
from sympy import pprint

#Create array of xdata
xdata=np.linspace(50, 240, 20)

#Create array of ydata
ydata=np.array([5.0,7.0,11.0,13.0,21.0,43.0,30.0,16.0,15.0,10.0,13.0,42.0,90.
↪0,75.0,29.0,13.0,8.0,4.0,6.0,3.0])

print(xdata, ydata)
```

```
[ 50.  60.  70.  80.  90. 100. 110. 120. 130. 140. 150. 160. 170. 180.
 190. 200. 210. 220. 230. 240.] [ 5.  7. 11. 13. 21. 43. 30. 16. 15. 10. 13. 42.
90. 75. 29. 13.  8.  4.
  6.  3.]
```

[55]:
```
#Define Lorentzian function
def Lorentz(x,  , Γ):
    return (1/np.pi)*((Γ/2)/((x- )**2+(Γ/2)**2))
```

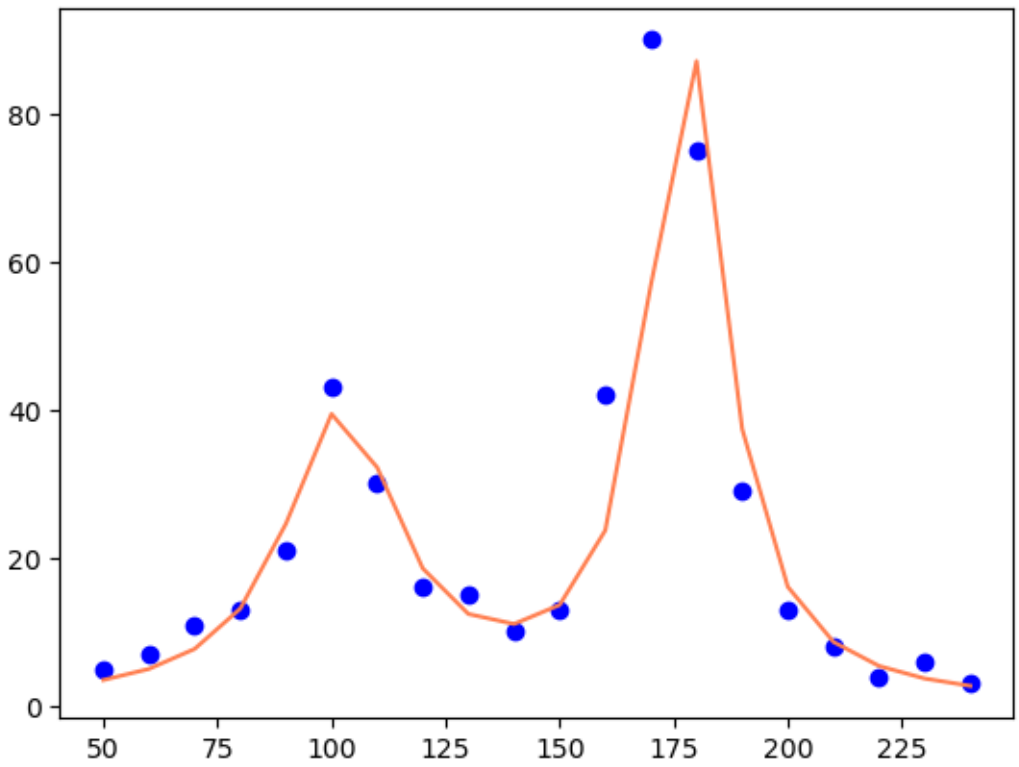
[58]:
```
#Define given constants
 1=102.1
 2=177.9
Γ1=30.0
Γ2=20.0
 =np.sqrt(ydata)

#Create X matrix
X=np.array([Lorentz(xdata,  1, Γ1)/ , Lorentz(xdata,  2, Γ2)/ ]).T

#Create Y matrix
Y=ydata/
```

[25]:
```
#Create  matrix
 =inv(np.matmul(X.T,X))
```

```
#Create matrix for solved linear constants
a=np.matmul( ,np.matmul(X.T, Y))
#[a1, a2]
print(a)
```

```
[1826.15001825 2812.5017766 ]
```

[67]:
```
#Create fit line
fit=a[0]*Lorentz(xdata,  1, Γ1)+ a[1]*Lorentz(xdata,  2, Γ2)

#Calculate chi-squared of the fit
X2=sum((ydata-fit)**2/ )


#Create Histogram and Fit Line

plt.plot(xdata, ydata, 'bo')
plt.plot(xdata, fit, '-', color='#ff7f50')
plt.show()

print('Chi-squraed= '+ str(X2))
print('Amplitude')
print(a)

print('Error Matrix')
pprint( )
```




```
Chi-squraed= 218.28563905649594
Amplitude
[1826.15001825 2812.5017766 ]
Error Matrix
 [[25001.87096858 -4160.74581984]
 [-4160.74581984 34201.43992264]]
```

[ ]: