

Problem 2 Jupyter

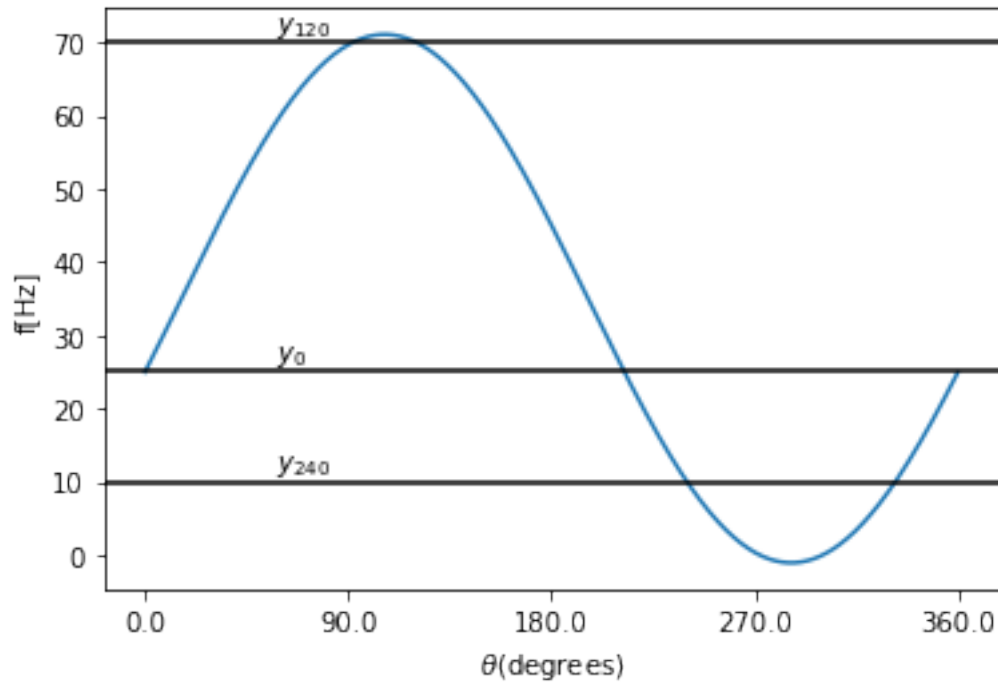
April 22, 2022

```
[2]: import numpy as np
import matplotlib.pyplot as plt
```

1 Part (f)

```
[24]: y0=25
y120=70
y240=10
k0,k1,k2=np.dot(np.linalg.inv([[1,0,1],
                                [1,np.sqrt(3)/2,-1/2],
                                [1,-np.sqrt(3)/2,-1/2]]),[y0,y120,y240])
```

```
[25]: theta=np.arange(0,2*np.pi,0.01)
f=lambda theta: k0+k1*np.sin(theta)+k2*np.cos(theta)
plt.plot(theta,f(theta))
plt.axhline(y0,color="black")
plt.text(1,y0,"$y_{0}$",va="bottom")
plt.axhline(y120,color="black")
plt.text(1,y120,"$y_{120}$",va="bottom")
plt.axhline(y240,color="black")
plt.text(1,y240,"$y_{240}$",va="bottom")
plt.ylabel("f [Hz] ")
plt.xlabel(r"$\theta$(degrees)")
plt.xticks(np.linspace(0,2*np.pi,5),np.linspace(0,360,5))
plt.show()
```



```
[49]: c1=round(np.sqrt(k1**2+k2**2),3)
      c0=k0
      theta0=round(np.degrees(np.arctan2(k1,k2)),3)
      print(f"c0={c0}")
      print(f"c1={c1}")
      print(f"theta0={theta0} degrees")
```

```
c0=35.0
c1=36.056
theta0=106.102 degrees
```

2 Part (G)

```
[66]: theta=np.radians([0,60,120,180,240,300])
      y=[25,40,70,30,10,15]

      X=np.array([np.sin(theta),np.cos(theta)]).T
```

we can solve for the values of mean squared error by performing a linear regression over k_0 , k_1 , k_2

```
[67]: from sklearn.linear_model import LinearRegression

      reg = LinearRegression().fit(X, y)
      k0=reg.intercept_
```

```

k1,k2=reg.coef_
c1=round(np.sqrt(k1**2+k2**2),3)
c0=k0
theta0=round(np.degrees(np.arctan2(k1,k2)),3)
print(f"c0={c0}")
print(f"c1={c1}")
print(f"theta0={theta0} degrees")

```

c0=31.666666666666664

c1=25.221

theta0=103.373 degrees

```

[68]: plt.plot(theta,y,"o")
theta=np.arange(0,2*np.pi,0.01)
f=lambda theta: k0+k1*np.sin(theta)+k2*np.cos(theta)
plt.plot(theta,f(theta))

```

[68]: [<matplotlib.lines.Line2D at 0x7fdb0039a910>]

