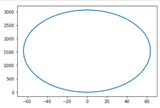
Question 01

In [7]:
```
def Calculation(a,b):
    print("The sum of the numbers you entered is",a+b,"And the difference of the \ntwo numbers is",a-b)
    return
Calculation(1,2)
```

```
The sum of the numbers you entered is 3 And the difference of the
two numbers is -1
```

Question 02

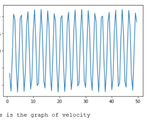
In [126]:
```
import matplotlib.pyplot as plt
import numpy as np
angle=np.arange(0,360,1)
def projectile (Vi,angle):
    global Rmax,Range
    p=np.sin(np.radians(angle))
    q=np.sin(np.radians(2*angle))
    g=9.8
    Rmax=((Vi**2)*(p)**2)/2*9.8
    Range=((Vi**2)*(q))/9.8
    return Rmax,Range
projectile(25,angle)
plt.plot(Range,Rmax)
plt.show()
```



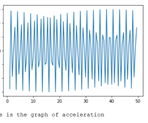
Question 03

In [166]:
```
import math
import matplotlib.pyplot as py
import numpy as np
time=np.arange(1,50,.5)
amp=40
w=(2*3.142)/time
phs=0
def disp(amp,w,time,phs):
    disp=amp*np.cos(w*time+phs)
    return disp
print("This is the graph of displacement")
plt.plot(time,disp(12,15,time,0))
plt.show()
def vel(amp,w,time,phs):
    vel=amp*w*(np.sin(w*time+phs))
    return vel
print("This is the graph of velocity")
plt.plot(time,vel(6,5,time,.1))
plt.show()
def acc(amp,w,time,phs):
    acc=amp*(w**2)*(np.cos(w*time+phs))
    return acc
print("This is the graph of acceleration")
plt.plot(time, acc(20,30,time,1))
plt.show()
```

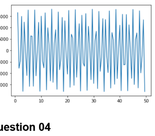
```
This is the graph of displacement
```



```
This is the graph of velocity
```



```
This is the graph of acceleration
```



Question 04

In [69]:
```
import numpy

print("Creating 5X2 integer array from a range between 100 to 200 such that the difference between each element is 10.")
samparr = numpy.arange(100, 200, 10)
samparr=samparr.reshape(5,2)
print (samparr)
```

```
Creating 5X2 integer array from a range between 100 to 200 such that the difference between each element is 10.
[[100 110]
 [120 130]
 [140 150]
 [160 170]
 [180 190]]
```

Question 05

In [79]:
```
import numpy
sampleArray = numpy.array([[34,43,73],[82,22,12],[53,94,66]])
newColumn = numpy.array([[10,10,10]])
print("Print original array")
print(sampleArray)
print("Array after deleting column 2 on axis 1 ")
sampleArray=np.delete(sampleArray,1,axis=1)
print(sampleArray)
print("Array after inserting column 2 on axis 1 ")
sampleArray=np.insert(sampleArray,1,newColumn,axis=1)
print(sampleArray)
```

```
Print original array
[[34 43 73]
 [82 22 12]
 [53 94 66]]
Array after deleting column 2 on axis 1
[[34 73]
 [82 12]
 [53 66]]
Array after inserting column 2 on axis 1
[[34 10 73]
 [82 10 12]
 [53 10 66]]
```

Question 06(a)

In [171]:
```
import numpy as np
import math
mag=7.3
ang=30
ang=np.radians(ang)
print("The x-component is",mag*math.cos(ang),"The y-component is",mag*math.sin(ang))
```

```
The x-component is 6.321955447626402 The y-component is 3.6499999999999995
```

Question 06(b)

In [187]:
```
import numpy as np
import math
a=6*10
ang1=30
ang1=np.radians(ang1)
ang2=105
ang2=np.radians(ang2)
ang3=ang1+ang2
ax=a*np.cos(ang1)
ay=a*np.sin(ang1)
bx=b*np.cos(ang3)
by=b*np.sin(ang3)
rx=ax+bx
ry=by+ay
print("The x-component of resultant is",rx,"\nThe y-component of resultant is",ry)
print("\nThe magnitude of the resultant vector is",math.sqrt((rx**2)+(ry**2)))
print("The angle that resultant makes with the +ve direction of the x-axis is",math.degrees(math.atan(ry/rx)))
```

```
The x-component of resultant is 1.5891862259769127
The y-component of resultant is 12.070167811065476

The magnitude of the resultant vector is 12.175225950174414
The angle that resultant makes with the +ve direction of the x-axis is 82.5
```

Question 06(c)

In [203]:
```
a=b=c=150
ang1=math.radians(30)
ang2=math.radians(195)
ang3=math.radians(315)
ax=a*math.cos(ang1)
ay=a*math.sin(ang1)
bx=a*math.cos(ang2)
by=a*math.sin(ang2)
cx=a*math.cos(ang3)
cy=a*math.sin(ang3)
r1x=ax+bx+cx
r1y=ay+by+cy
r1=math.sqrt(r1x**2+r1y**2)
ang1=math.atan(r1y/r1x)
ang1=math.degrees(ang1)
print("(i)The magnitude of a+b+c is",r1,"\nand its angle is",ang1)
r2x=ax-bx+cx
r2y=ay-by+cy
r2=math.sqrt(r2x**2+r2y**2)
ang1=math.atan(r2y/r2x)
ang1=math.degrees(ang1)
print("(ii)The magnitude of a-b+c is",r2,"\nand its angle is",ang1i)
# since (a+b)-(c+d)=0, then d=a+b-c
r3x=ax+bx-cx
r3y=ay+by-cy
r3=math.sqrt(r3x**2+r3y**2)
ang1ii=math.atan(r3y/r3x)
ang1ii=math.degrees(ang1ii)
print("(iii)The magnitude of d=a+b-c is",r3,"\nand its angle is",ang1ii)
```

```
(i)The magnitude of a+b+c is 114.80503970952655
and its angle is -37.500000000000002
(ii)The magnitude of a-b+c is 280.93764615924163
and its angle is 1.1667653647426427
(iii)The magnitude of d=a+b-c is 186.77923007491623
and its angle is -0.06571322469377776
```

Question 06(d)

In [213]:
```
import numpy as np
import math
#since A=2i-3j+5k its magnitude will be given by
Ax=2
Ay=-3
Az=5
magA=math.sqrt(Ax**2+Ay**2+Az**2)
#the vector along x-axis will be X=i-0j+0k
Xx=1
Xy=0
Xz=0
magX=math.sqrt(Xx**2+Xy**2+Xz**2)
#the angle will be calculated by dividing the dotproduct of
#both vectors by the product of their magnitudes and then taking its Cos inverse
angX=math.acos((Ax*Xx)+(Ay*Xy)+(Az*Xz))/(magA*magX))
angX=math.degrees(angX)
print("The angle that vector A makes with the x-axis is",angX)
#the vector along y-axis will be Y=0i+1j+0k
Yx=0
Yy=1
Yz=0
magY=math.sqrt(Yx**2+Yy**2+Yz**2)
#the angle will be calculated by dividing the dotproduct of
#both vectors by the product of their magnitudes and then taking its Cos inverse
angY=math.acos((Ax*Yx)+(Ay*Yy)+(Az*Yz))/(magA*magY))
angY=math.degrees(angY)
print("The angle that vector A makes with the y-axis is",angY)
#the vector along z-axis will be Z=0i-0j+k
Zx=0
Zy=0
Zz=1
magZ=math.sqrt(Zx**2+Zy**2+Zz**2)
#the angle will be calculated by dividing the dotproduct of
#both vectors by the product of their magnitudes and then taking its Cos inverse
angZ=math.acos((Ax*Zx)+(Ay*Zy)+(Az*Zz))/(magA*magZ))
angZ=math.degrees(angZ)
print("The angle that vector A makes with the z-axis is",angZ)
```

```
The angle that vector A makes with the x-axis is 71.06317681913482
The angle that vector A makes with the y-axis is 119.12156907035144
The angle that vector A makes with the z-axis is 35.795759914707084
```

Question 06(e)

In [6]:
```
import math
#since r=a+b+c then its x,y and z components will be calculated
#with the help of vector a,b and c that's why we'll first have to
#work on them
#vector a is given by a=5i+4j-6k thus,
ax=5
ay=4
az=-6
#vector b is given by ab=-2i+2j+3k thus,
bx=-2
by=2
bz=3
#vector c is given by c=4i+3j+2k thus,
cx=4
cy=3
cz=2
#now we are in a position to work on vector r, we calculate its
#x,y and z components
rx=ax+bx+cx
ry=ay+by+cy
rz=az+bz+cz
#now calculating the magnitude of r
magr=math.sqrt(rx**2+ry**2+rz**2)
#the vector along r-axis will be R=0i-0j+k and its magnitude will be
Rx=0
Ry=0
Rz=1
magR=math.sqrt(Rx**2+Ry**2+Rz**2)
#the angle will be calculated by dividing the dotproduct of
#both vectors by the product of their magnitudes and then taking its Cos inverse
angr=math.acos(((rx*Rx)+ry*Ry)+(rz*Rz))/(magr*magR))
angr=math.degrees(angr)
print("The angle that vector r makes with the x-axis is",angr)
```

```
The angle that vector r makes with the z-axis is 95.01234637696903
```

In [ ]: