Application of Integral

Including Necessary Library

In [1]:

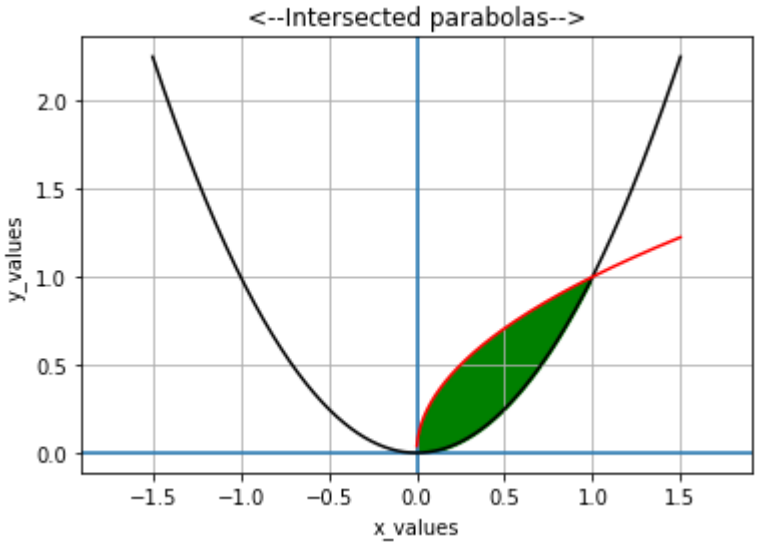
```
import numpy as np
import matplotlib.pyplot as plt
import matplotlib as mlt
import pandas as pd
from sympy import *
from sympy import sqrt
```

Plotting Graph Between the Two Parabola

In [3]:

```
fig=plt.figure()
x=Symbol('x')
x=np.linspace(-1.5,1.5,1000)
y=np.linspace(-1.5,1.5,1000)
y1=x**2
y2=np.sqrt(y)
plt.axhline()
plt.axvline()
plt.plot(x,y1,'-k')
plt.plot(y,y2,'-r')
plt.axis("equal")
plt.xlabel("x_values")
plt.ylabel("y_values")
plt.title("<--Intersected parabolas-->")
plt.fill_between(x,y1,y2,where=[(x>0) and (x<1) for x in x],color='g')
plt.grid()
plt.show()
fig.savefig(r"C:\Users\Lenovo\OneDrive\Pictures\saved_figure\application_of_Integration
3.png")
```

```
C:\Users\Lenovo\Anaconda3\lib\site-packages\ipykernel_launcher.py:6: Runti
meWarning: invalid value encountered in sqrt
```



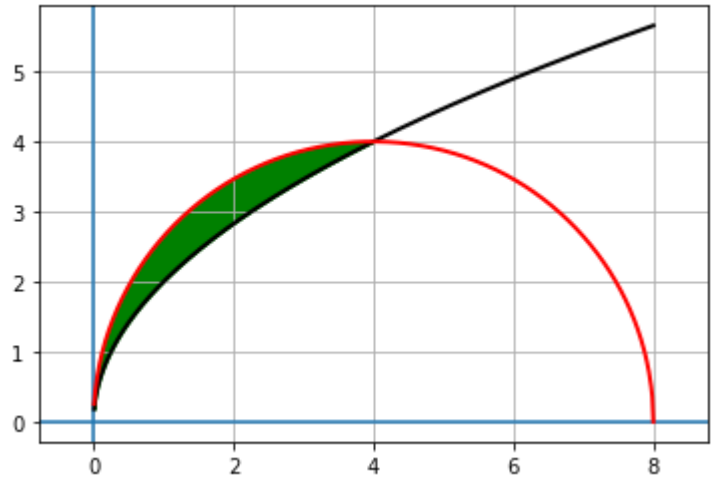
Plotting Graph Between the Circle and Parabola

In [4]:

```
fig=plt.figure()
x=Symbol('x')
q=Symbol('q')
x=np.linspace(-8,8,1000)
r=integrate(sqrt(4*q),(q,0,4))
s=integrate(sqrt(16-(q-4)**2),(q,4,8))
t=r+s
y1=np.sqrt(4*x)
y2=np.sqrt(16-(x-4)**2)
plt.axhline()
plt.axvline()
plt.plot(x,y1,'-k',linewidth=2)
plt.plot(x,y2,'-r',linewidth=2)
plt.axis("equal")
plt.fill_between(x,y1,y2,where=[(x>0) and (x<4) for x in x],color='g')
plt.grid()
plt.show()
print('The Region inside the figure is:',t)
fig.savefig(r"C:\Users\Lenovo\Desktop\Jupyter note book\saved_figure\application_of_Integration4.png")
```

```
C:\Users\Lenovo\Anaconda3\lib\site-packages\ipykernel_launcher.py:8: Runti
meWarning: invalid value encountered in sqrt

C:\Users\Lenovo\Anaconda3\lib\site-packages\ipykernel_launcher.py:9: Runti
meWarning: invalid value encountered in sqrt
  if __name__ == '__main__':
```

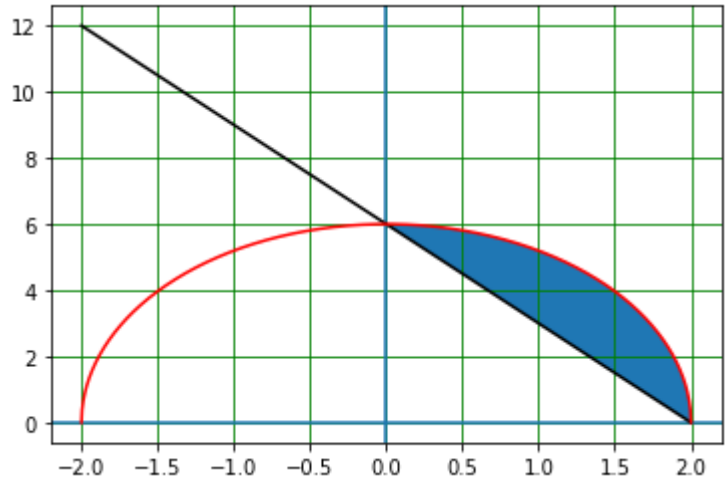



```
The Region inside the figure is: 32/3 + 4*pi
```

Plotting Graph Between the Line with Circle

In [5]:

```
fig=plt.figure()
x=Symbol('x')
q=Symbol('q')
x=np.linspace(-2,2,1000)
r=integrate(sqrt(4-q**2),(q,0,2))
s=integrate((6-(3*q)),(q,0,2))
t=(r*3)-s
y1=6-(3*x)
y2=np.sqrt(36-9*x**2)
plt.axhline()
plt.axvline()
plt.plot(x,y1,'-k')
plt.plot(x,y2,'-r')
plt.fill_between(x,y1,y2,where=[(x>0) and (x<2) for x in x])
plt.grid(color='g')
plt.show()
print('The Region inside the figure is:',t)
```




```
The Region inside the figure is: -6 + 3*pi
```

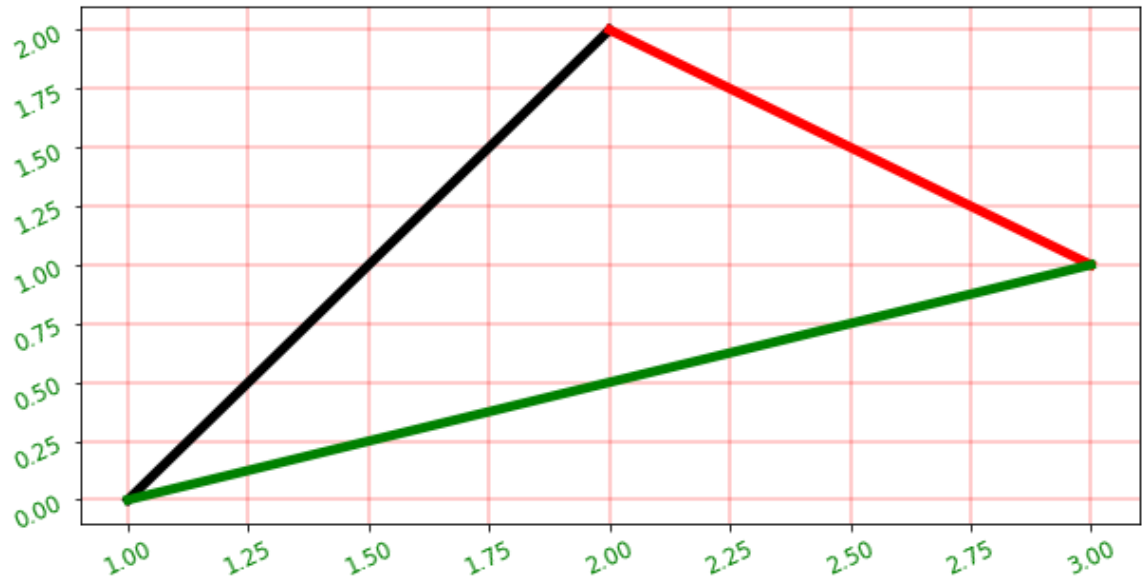
In [254]:

```
plt.style.use("classic")
```

Plotting Graph For three lines

In [9]:

```
fig=plt.figure()
x=Symbol('x')
q=Symbol('q')
e=Symbol('e')
f=Symbol('f')
x=np.linspace(1,2,1000)
e=np.linspace(2,3,1000)
f=np.linspace(1,3,1000)
r=integrate((2*q)-2,(q,1,2))
s=integrate(4-q,(q,2,3))
w=integrate((q-1)/2,(q,1,3))
t=r+s-w
y1=(2*x)-2
y2=4-e
y3=(f-1)/2
#plt.axhline()
#plt.axvline()
plt.plot(x,y1,'-k',linewidth=5)
plt.plot(e,y2,'-r',linewidth=5)
plt.plot(f,y3,'-g',linewidth=5)
plt.rcParams["figure.figsize"]=(10,5)
plt.tick_params(labelsize=12,labelcolor='green',labelrotation=25,grid_color='r',grid_al
pha=0.2,grid_linewidth=2)
plt.grid()
plt.show()
print('The Region inside the figure is:',t)
fig.savefig(r"C:\Users\Lenovo\Desktop\Jupyter note book\saved_figure\application_of_Int
egration1.png")
```




```
The Region inside the figure is: 3/2
```

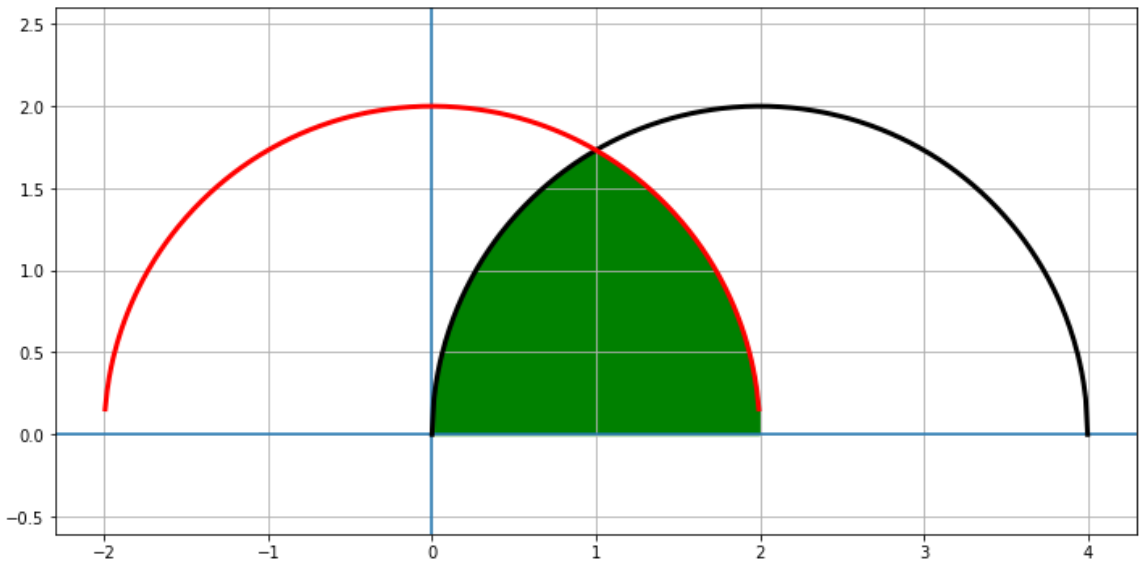
Plotting Graph Between the Two Circle

In [7]:

```
fig=plt.figure()
x=Symbol('x')
q=Symbol('q')
x=np.linspace(-8,4,1000)
r=integrate(sqrt(4-(q-2)**2),(q,0,1))
s=integrate(sqrt(4-q**2),(q,1,2))
t=s+r
y1=np.sqrt(4-(x-2)**2)
y2=np.sqrt(4-x**2)
plt.axhline()
plt.axvline()
plt.plot(x,y1,'-k',linewidth=3)
plt.plot(x,y2,'-r',linewidth=3)
plt.fill_between(x,y1,where=[(x>0) and (x<1) for x in x],color='g')
plt.fill_between(x,y2,where=[(x>1) and (x<2) for x in x],color='g')
plt.axis('equal')
plt.grid()
plt.rcParams["figure.figsize"]=(12,6)
plt.show()
print('The Region inside the figure is:',2*t)
fig.savefig(r"C:\Users\Lenovo\OneDrive\Pictures\saved_figure\application_of_Integration
2.png")
```

```
C:\Users\Lenovo\Anaconda3\lib\site-packages\ipykernel_launcher.py:8: Runti
meWarning: invalid value encountered in sqrt

C:\Users\Lenovo\Anaconda3\lib\site-packages\ipykernel_launcher.py:9: Runti
meWarning: invalid value encountered in sqrt
  if __name__ == '__main__':
```




```
The Region inside the figure is: -2*sqrt(3) + 8*pi/3
```

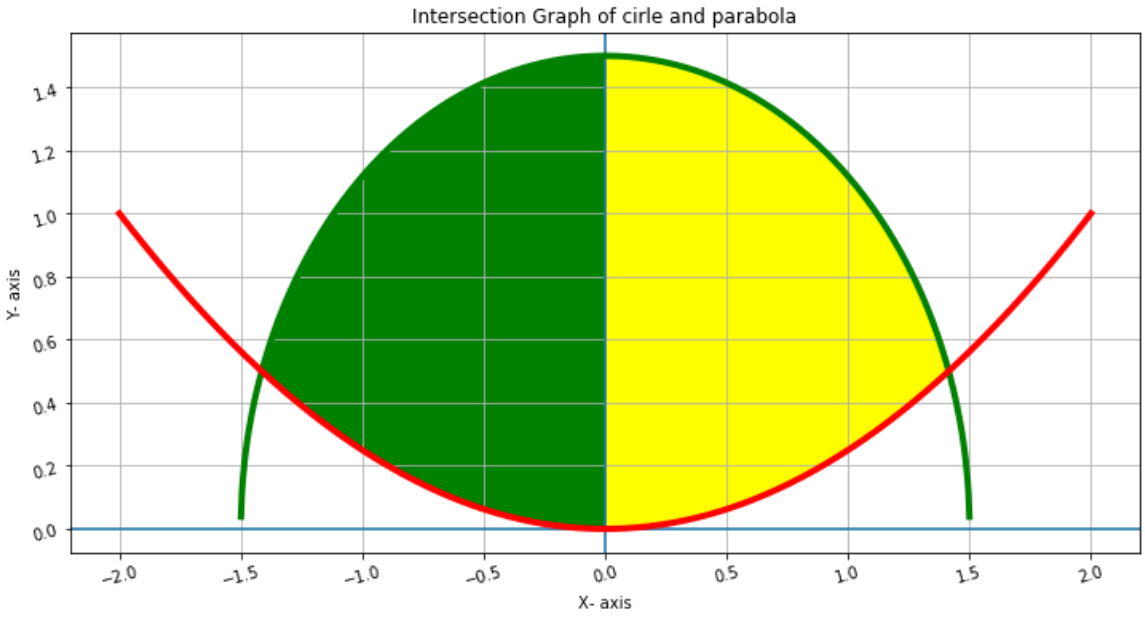
Plotting Graph Between the Circle and Parabola

In [3]:

```
fig=plt.figure()
x=Symbol('x')
q=Symbol('q')
x=np.linspace(-2,2,1000)
y1=integrate(sqrt((9/4)-q**2),(q,-sqrt(2),0))
y2=integrate((q**2)/4,(q,0,sqrt(2)))
w=y1-y2
y3=np.sqrt((9/4)-x**2)
y4=(x**2)/4
plt.axhline()
plt.axvline()
plt.grid()
plt.xlabel("X- axis",)
plt.ylabel("Y- axis")
plt.title("Intersection Graph of cirle and parabola")
plt.rcParams["figure.figsize"]=(12,6)
plt.tick_params(labelrotation=15)
plt.fill_between(x,y3,y4,where=[(x>-sqrt(2)) and (x<0) for x in x],color='g')
plt.fill_between(x,y3,y4,where=[(x>0) and (x<sqrt(2)) for x in x],color='yellow')
plt.plot(x,y3,'-g',linewidth=4)
plt.plot(x,y4,'-r',linewidth=4)
fig.savefig(r"C:\Users\Lenovo\OneDrive\Pictures\saved_figure\circle_and_parabola_curve.
png")
print(w)
```

```
C:\Users\Lenovo\Anaconda3\lib\site-packages\ipykernel_launcher.py:8: Runti
meWarning: invalid value encountered in sqrt
```

```
0.0833333333333334*sqrt(2) + 1.125*asin(0.666666666666667*sqrt(2))
```



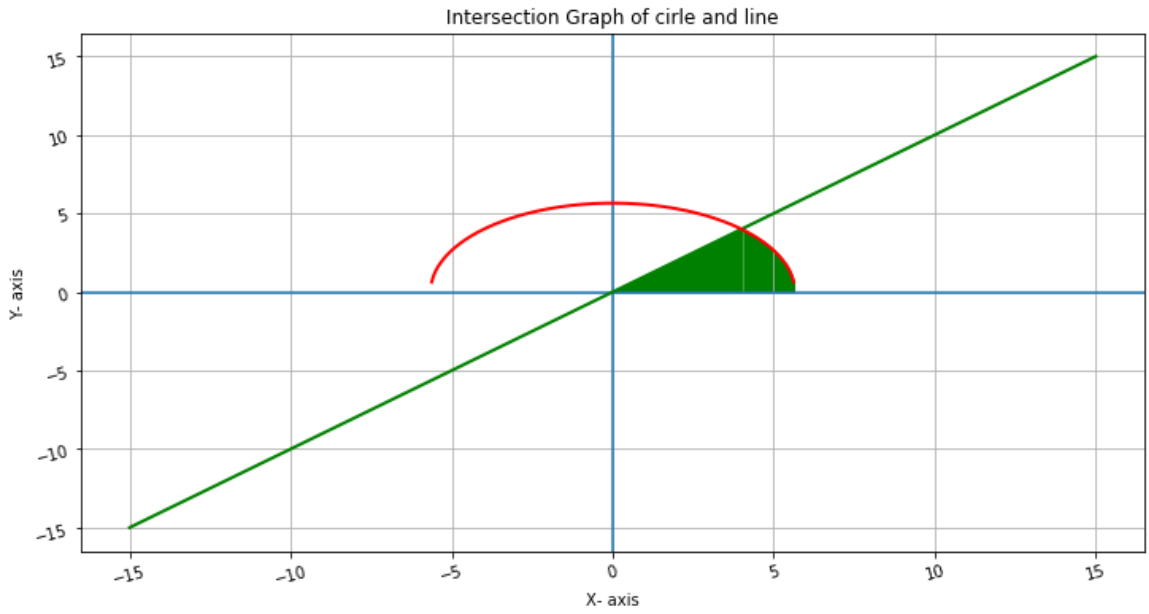
Plotting Graph Between the Circle and Line

In [4]:

```
fig=plt.figure()
x=Symbol('x')
q=Symbol('q')
x=np.linspace(-15,15,500)
y1=integrate(q,(q,0,4))
y2=integrate(sqrt(32-q**2),(q,4,4*sqrt(2)))
w=y1+y2
y3=x
y4=np.sqrt(32-x**2)
plt.axhline()
plt.axvline()
plt.grid()
plt.xlabel("X- axis",)
plt.ylabel("Y- axis")
plt.title("Intersection Graph of cirle and line")
plt.rcParams["figure.figsize"]=(12,6)
plt.tick_params(labelrotation=15)
plt.fill_between(x,y3,where=[(x>0) and (x<4) for x in x],color='g')
plt.fill_between(x,y4,where=[(x>4) and (x<4*sqrt(2)) for x in x],color='g')
plt.plot(x,y3,'-g',linewidth=2)
plt.plot(x,y4,'-r',linewidth=2)
#fig.savefig(r"C:\Users\Lenovo\OneDrive\Pictures\saved_figure\circle_and_parabola_curve.png")
print(w)
```

```
C:\Users\Lenovo\Anaconda3\lib\site-packages\ipykernel_launcher.py:9: RuntimeWarning: invalid value encountered in sqrt
  if __name__ == '__main__':

4*pi
```



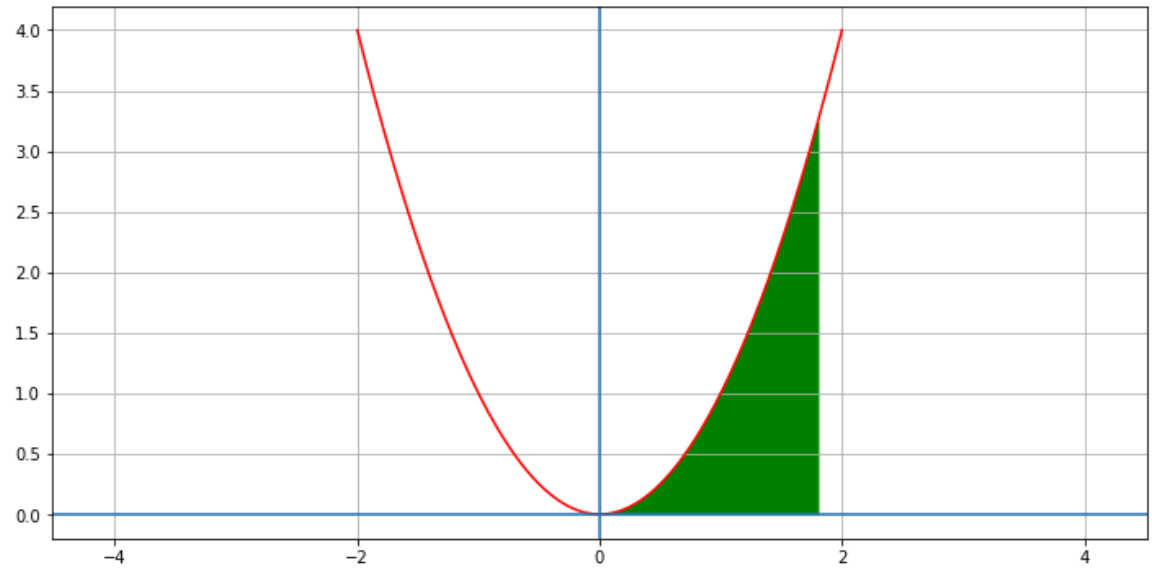
plotting area under the Curve

In [8]:

```
import numpy as np
import matplotlib.pyplot as plt
import matplotlib as mlt
import pandas as pd
from sympy import *
from sympy import sqrt
```

In [5]:

```
fig=plt.figure()
x=Symbol('x')
x=np.linspace(-2,2,1000)
y1=x**2
plt.plot(x,y1,'r')
plt.grid()
plt.axhline()
plt.axvline()
plt.axis("equal")
plt.rcParams["figure.figsize"]=(12,6)
plt.fill_between(x,y1,where=[(x>0) and (x<1.8) for x in x],color='g')
fig.savefig(r"C:\Users\Lenovo\OneDrive\Pictures\saved_figure\parabola(upwords).png")
```



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