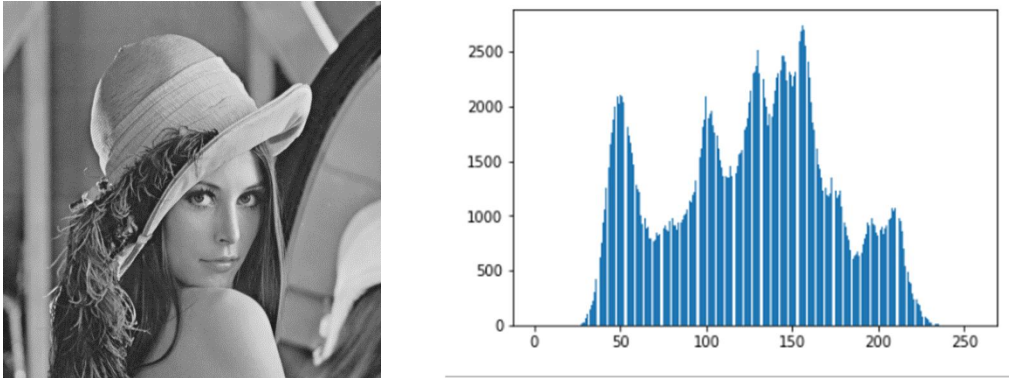# Computer Vision HW#3

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Part 1.

(a) original image and its histogram


The figure below is how I get the histogram

```python
hist0=[0]*256
hist13=[0]*256
for i in range(rows):
    for j in range(cols):
        hist0[(src[i,j])]+=1
        hist13[(Lena13[i,j])]+=1
```

(b) image with intensity divided by 3 and its histogram

divide the intensity by 3

```python
rows,cols=src.shape
Lena13=np.zeros(shape=src.shape,dtype=src.dtype)
for i in range(rows):
    for j in range(cols):
        Lena13[i,j]=src[i,j]/3
cv2.imwrite("lena1Over3.png",Lena13)
```
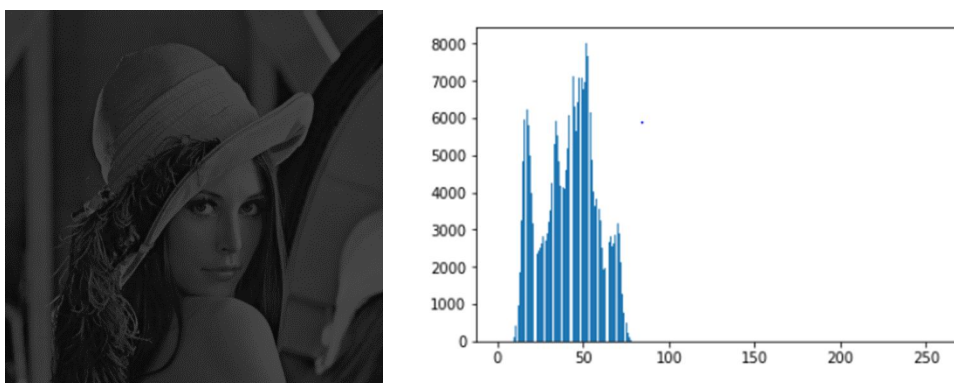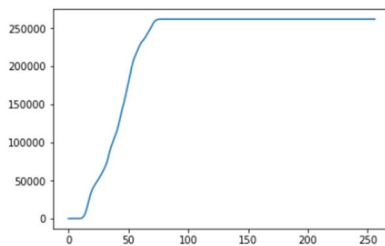
(c) image after applying histogram equalization to (b) and its histogram

First, plot the cdf

```
In [27]:    1  #plot the cdf
            2  cdf=[0]*257
            3  for i in range(len(hist13)):
            4      cdf[i+1]=hist13[i]+cdf[i]
            5
            6  plt.plot(cdf)
```

```
Out[27]:  [<matplotlib.lines.Line2D at 0x1bd81a17be0>]
```


Second, renormalize the cdf

```
In [73]:    1  #renormalize the cdf
            2  nj=(cdf-cdf.min())*255
            3  N=cdf.max()-cdf.min()
            4  cdfNew=nj/N
            5
```

Get the value from cumulative sum for every index in "flat", flat is a 1-D array which is reshape from the Lena in problem (b).

```
In [67]:    1  cdfNew=cdfNew.astype("uint8")
            2  lena13=cv2.imread("lena1Over3.png")
            3  flat = lena13.flatten()
            4  lenaEqual1D = cdfNew[flat]
            5  #統計成histogram
            6  histEq=[0]*256
            7  for i in lenaEqual1D:
            8      histEq[lenaEqual1D[i]]+=1
```

Now we just need to plot the histogram and reshape the 1-D array into 2-D image

```
In [71]:    1  #trun 1D array into an image
            2  #LenaEqual2D==np.zeros(shape=src.shape,dtype=src.dtype)
            3  lenaEqual2D=np.reshape(lenaEqual1D, lena13.shape)
            4  cv2.imwrite("lenaEqual.png",lenaEqual2D)
```

```
Out[71]:  True
```