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In []:

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#Question 01
import numpy as np
import cv2 as cv
import matplotlib.pyplot as plt

img = cv.imread('spider.png', cv.IMREAD_GRAYSCALE)
assert img is not None

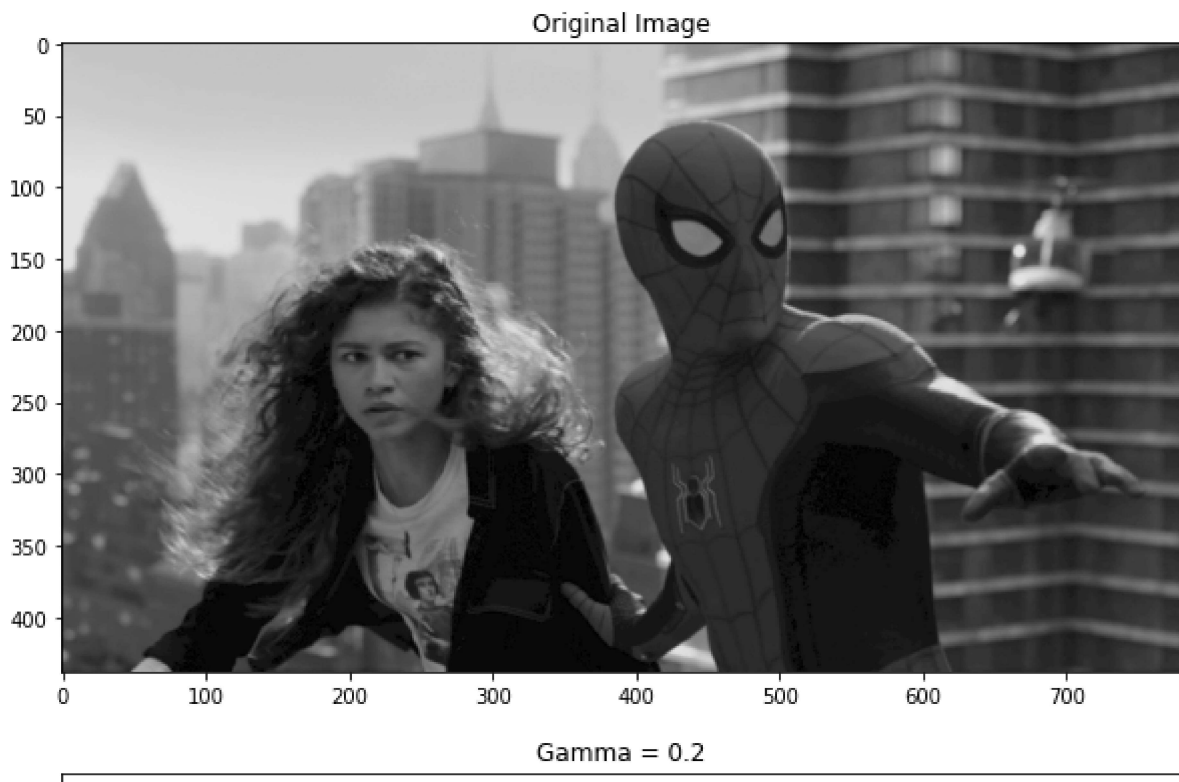
# Original Image
fig, ax = plt.subplots(figsize=(10,8))
RGB_img = cv.cvtColor(img, cv.COLOR_BGR2RGB)
ax.imshow(RGB_img)
ax.set_title('Original Image')

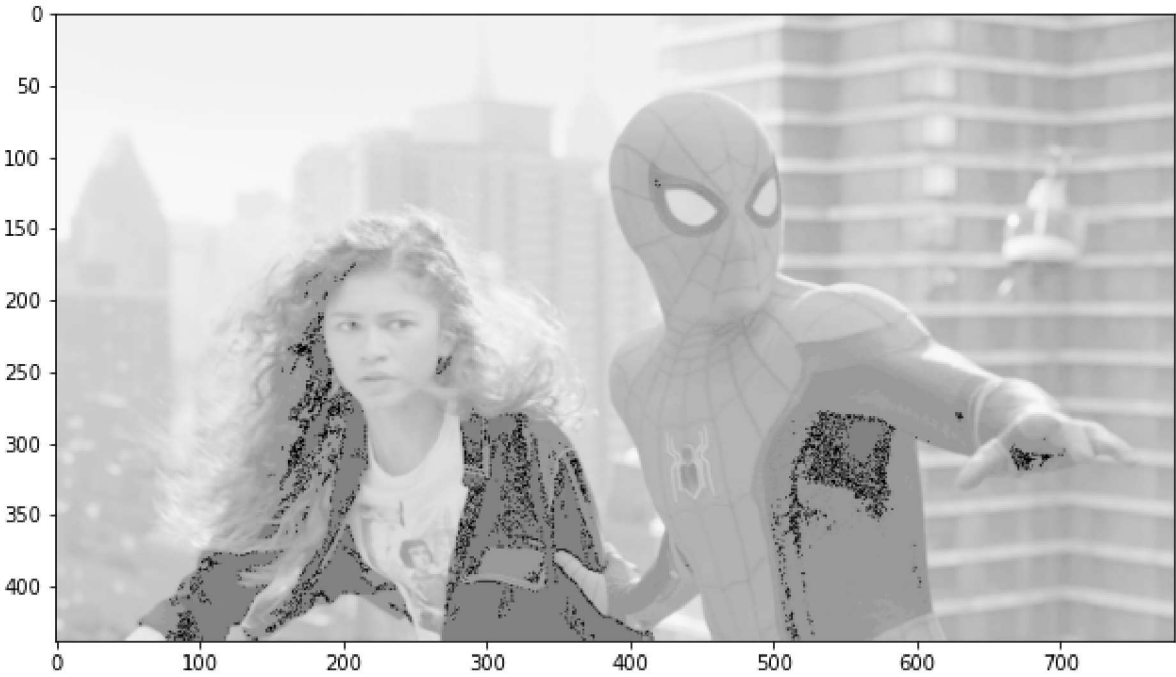
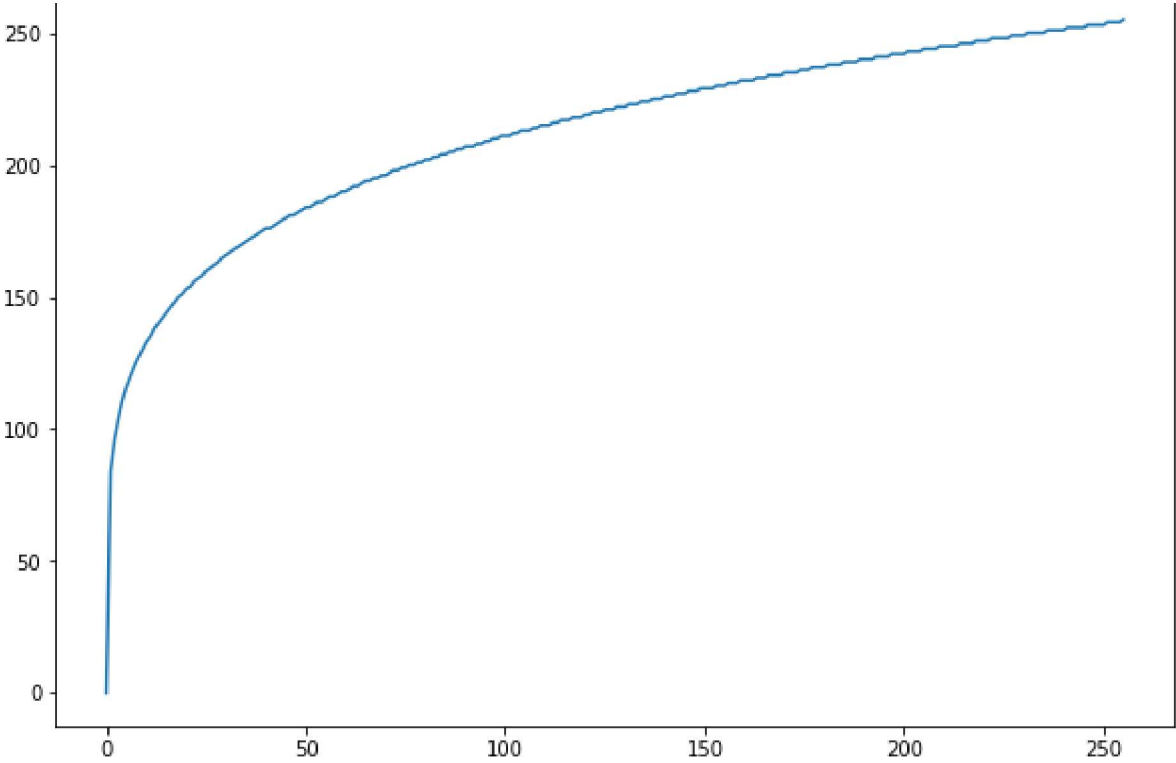
# gamma correctioned images
fig, ax = plt.subplots(8, 1, figsize=(10,64))
gamma = [0.2, 0.8, 1.2, 2] # List of gamma values
image_num = 0
for ga in gamma:
    t = np.array([(p/255)**ga*255 for p in range(0, 256)]).astype(np.uint8)
    g = cv.LUT(img, t)
    img_colorConverted = cv.cvtColor(g, cv.COLOR_BGR2RGB) # color converting

    ax[image_num].plot(t)
    ax[image_num+1].imshow(img_colorConverted)
    ax[image_num].set_title('Gamma = '+str(ga))
    image_num += 2

plt.show()

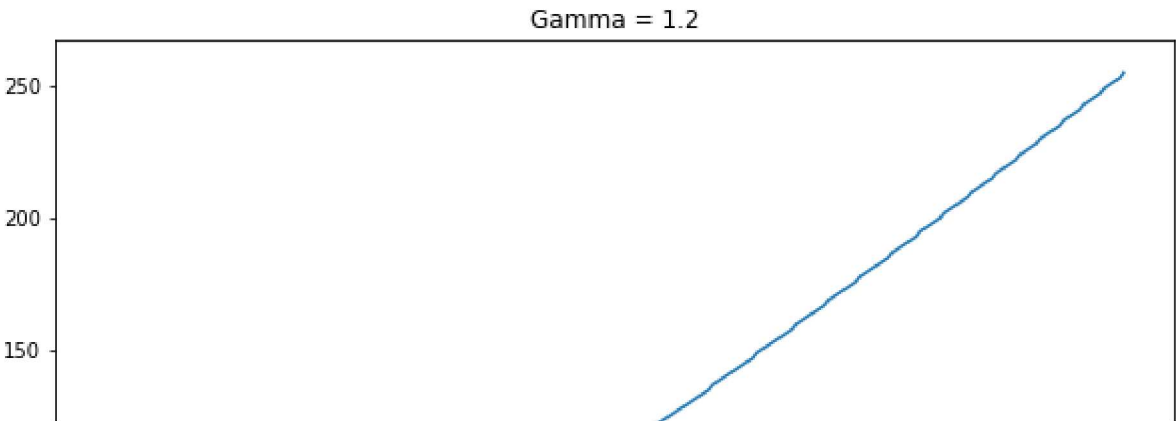
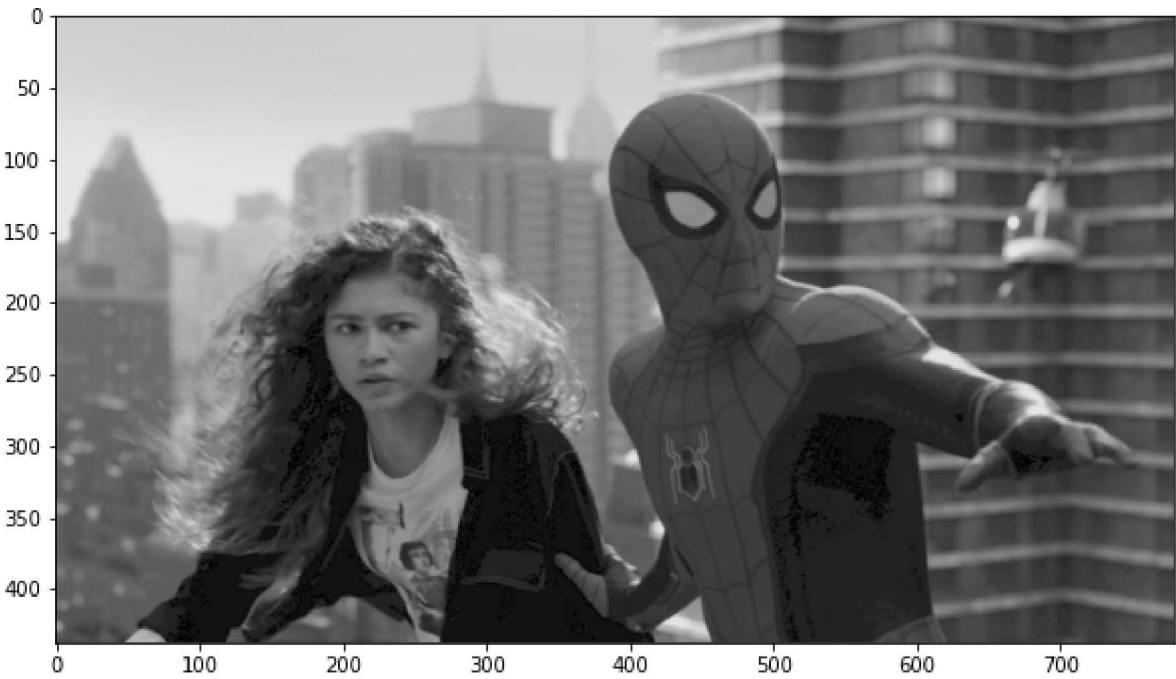
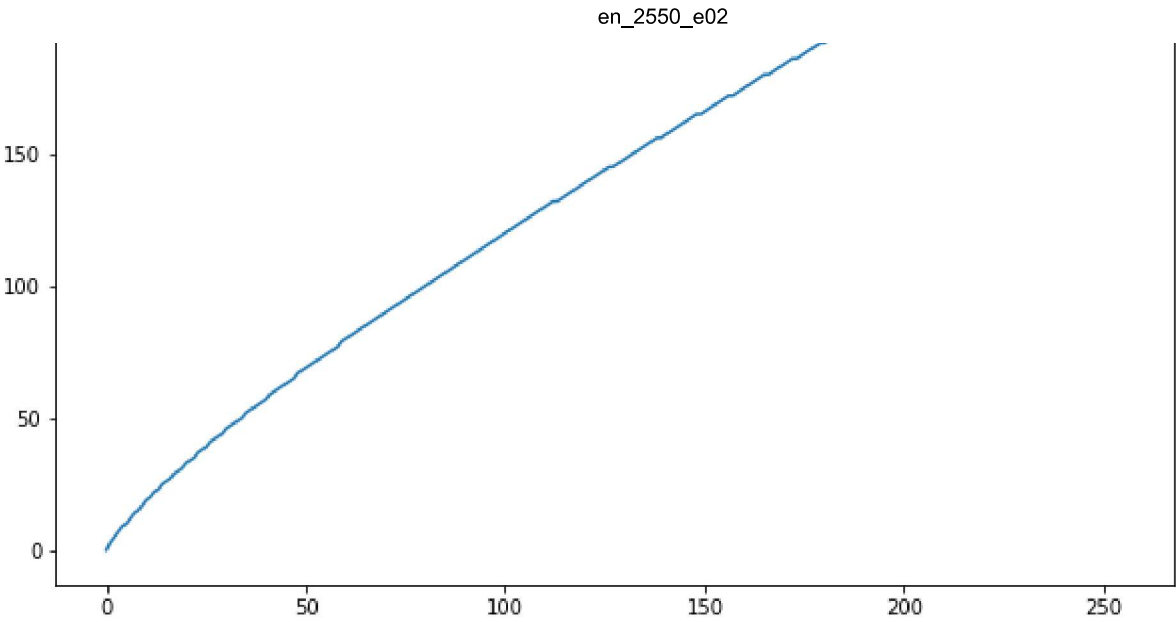
```

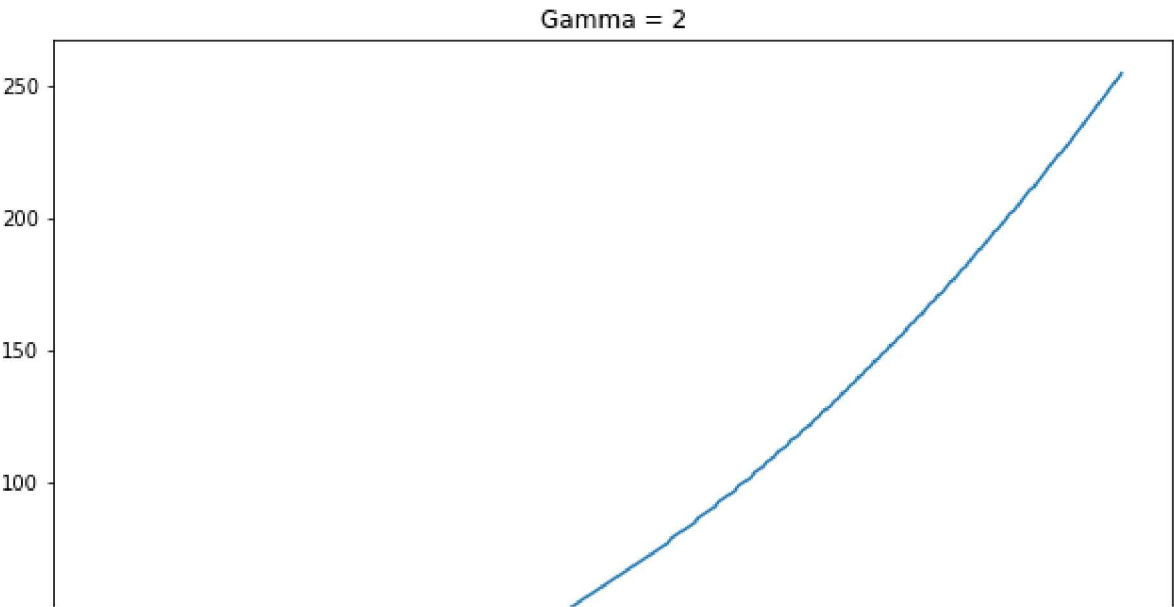
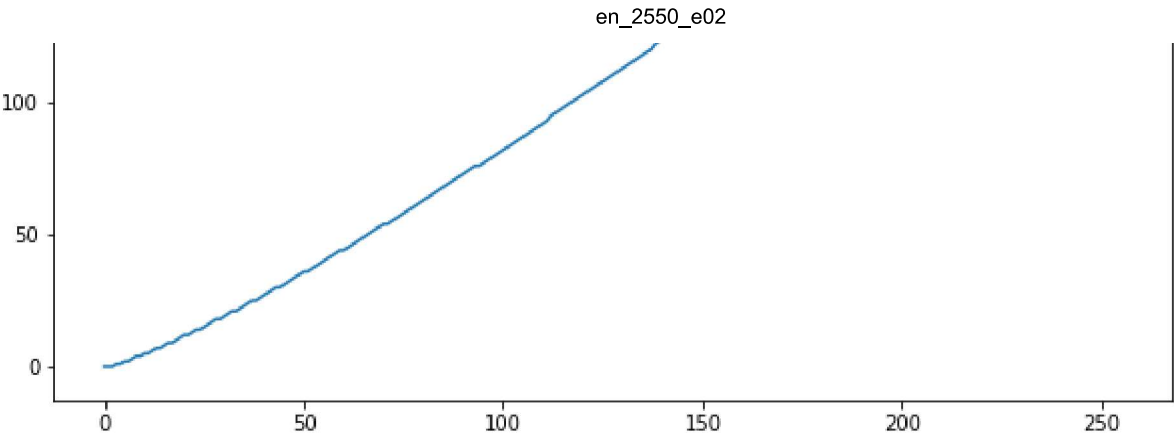


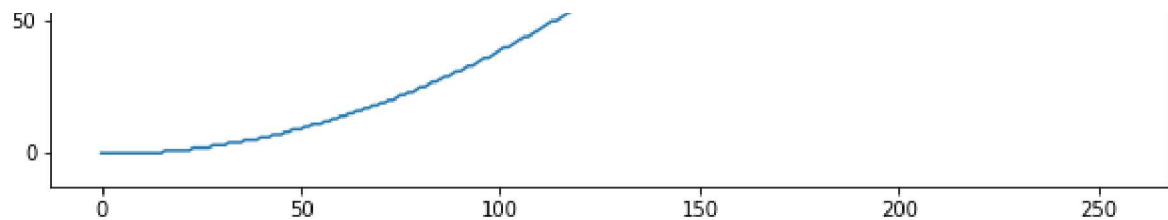


Gamma = 0.8









In []:

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# Question 02
import numpy as np
import cv2 as cv
import matplotlib.pyplot as plt

f = cv.imread('spider.png', cv.IMREAD_GRAYSCALE)
assert f is not None

# values in ranges
t1 = np.linspace(0, 100, 50)
t2 = np.linspace(100, 255, 150)
t3 = np.ones(56)*255

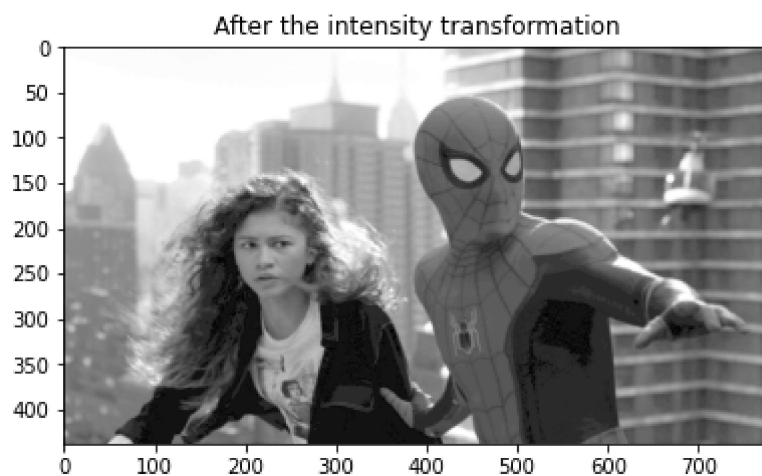
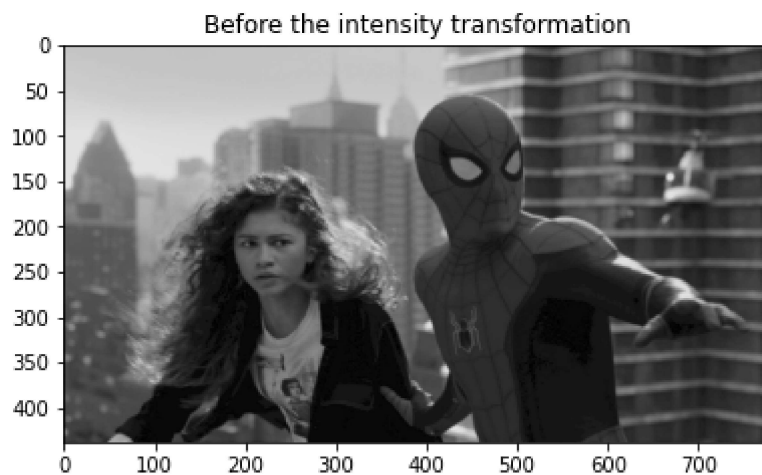
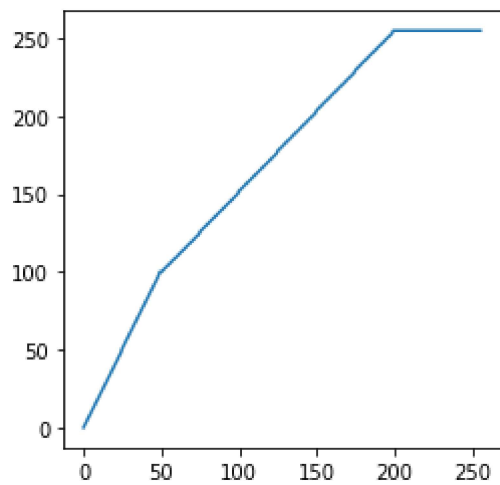
t = np.concatenate((t1,t2,t3), axis=0).astype(np.uint8) # create the full range array

# plotting the intensity transformation graph
fig, ax = plt.subplots()
ax.plot(t)
ax.set_aspect('equal')
assert len(t) == 256
g = cv.LUT(f, t)

# showing the images
fig, ax = plt.subplots(2, 1, figsize=(10, 8))
f_colorConverted = cv.cvtColor(f, cv.COLOR_BGR2RGB)
g_colorConverted = cv.cvtColor(g, cv.COLOR_BGR2RGB)
```

```
ax[0].imshow(f_colorConverted)
ax[0].set_title('Before the intensity transformation')

ax[1].imshow(g_colorConverted)
ax[1].set_title('After the intensity transformation')
plt.show()
```



In []:

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# Question 03
import numpy as np
import cv2 as cv
import matplotlib.pyplot as plt

f = cv.imread('shells.tif', cv.IMREAD_GRAYSCALE)
```

```

assert f is not True

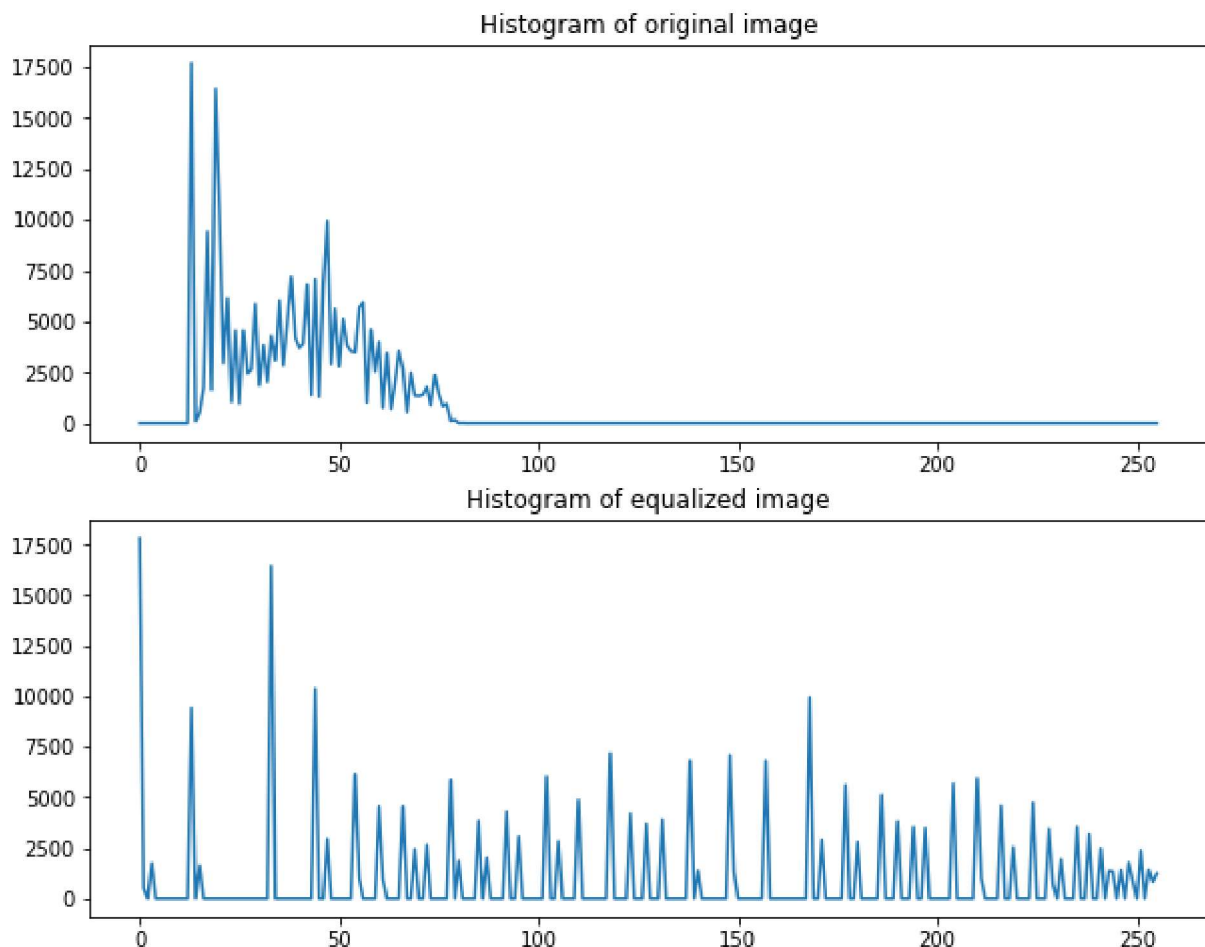
hist_f = cv.calcHist([f], [0], None, [256], [0, 256])
g = cv.equalizeHist(f)
hist_g = cv.calcHist([g], [0], None, [256], [0, 256])

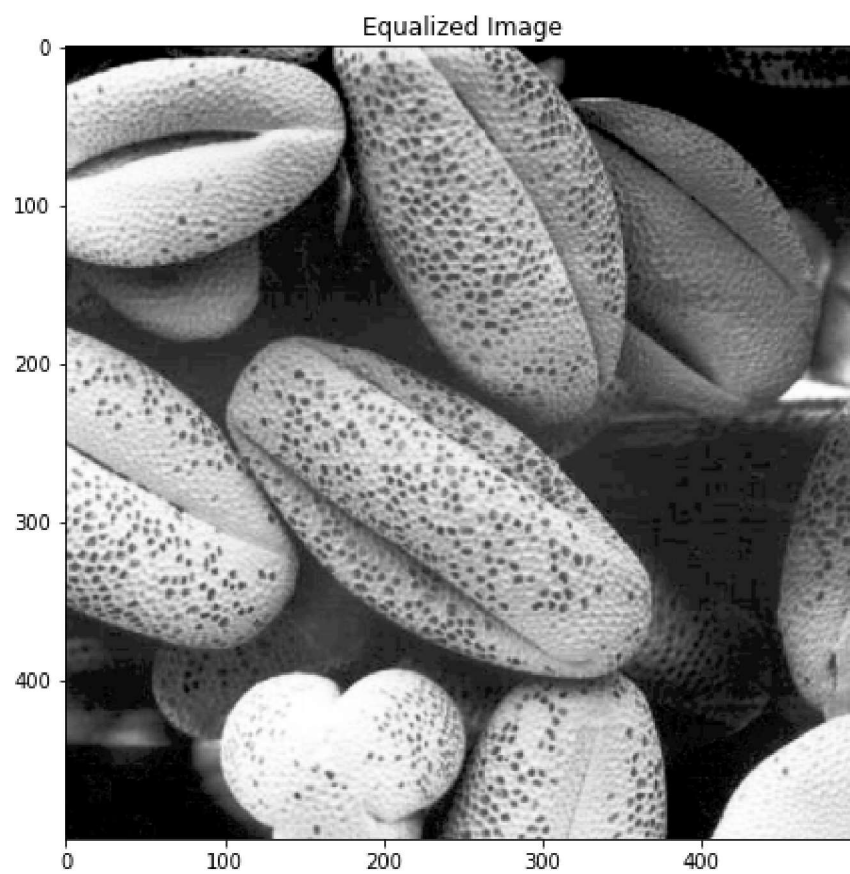
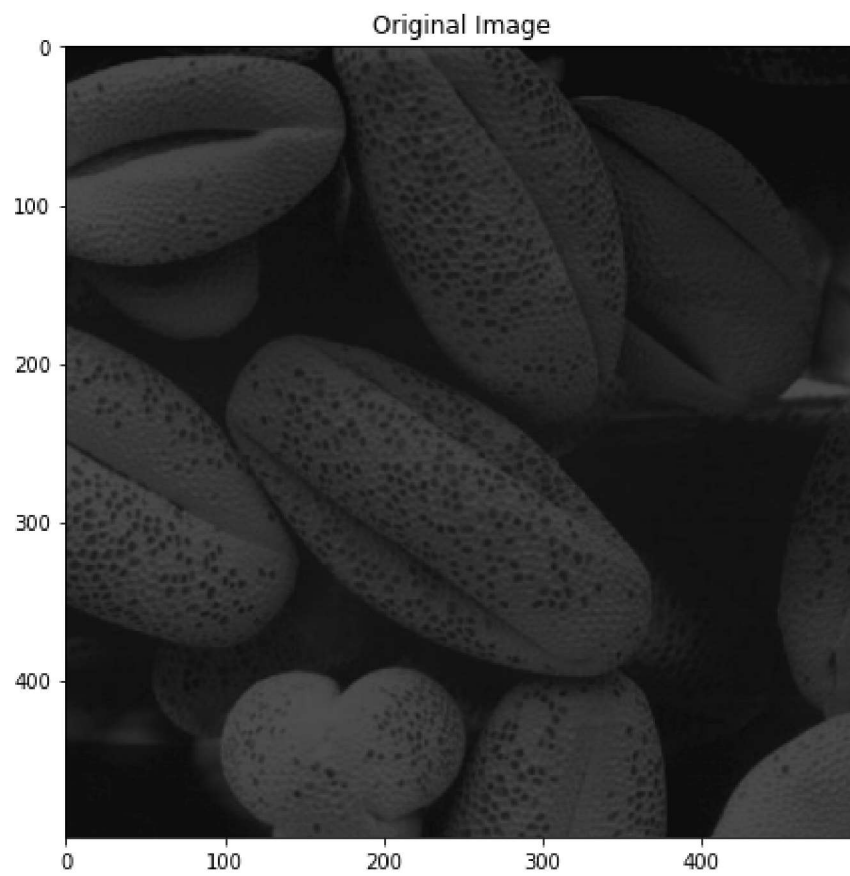
fig, ax = plt.subplots(2, 1, figsize=(10, 8))
ax[0].plot(hist_f)
ax[0].set_title('Histogram of original image')
ax[1].plot(hist_g)
ax[1].set_title('Histogram of equalized image')

fig, ax = plt.subplots(2, 1, figsize=(20, 16))
f_colorConverted = cv.cvtColor(f, cv.COLOR_BGR2RGB)
g_colorConverted = cv.cvtColor(g, cv.COLOR_BGR2RGB)
ax[0].imshow(f_colorConverted)
ax[0].set_title('Original Image')

ax[1].imshow(g_colorConverted)
ax[1].set_title('Equalized Image')
plt.show()

```





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In [ ]: # Question 04  
        # part (a)
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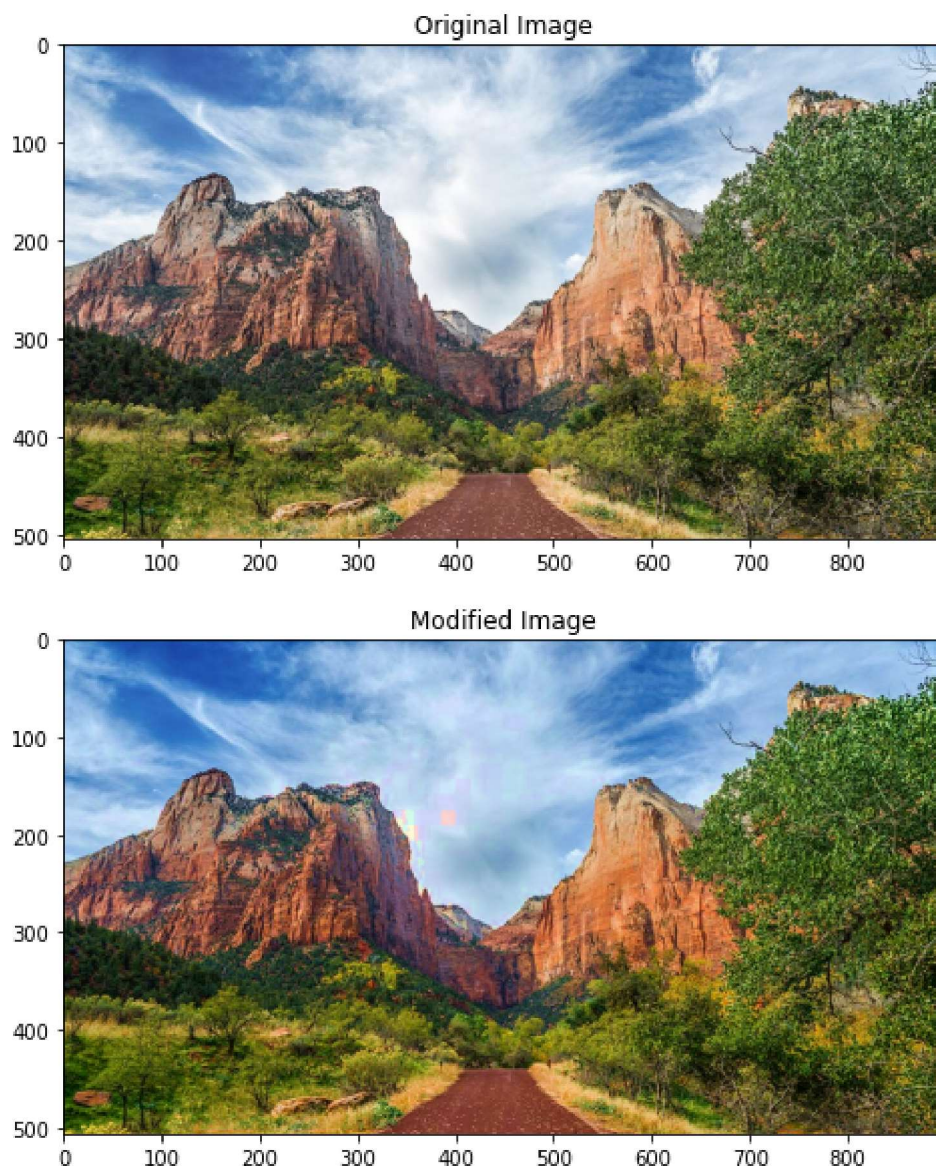


```
import numpy as np
import cv2 as cv
import matplotlib.pyplot as plt

img = cv.imread('zion_pass.jpg')
img = cv.cvtColor(img, cv.COLOR_BGR2RGB)
img1 = cv.cvtColor(img, cv.COLOR_RGB2HSV)
h,s,v = cv.split(img1)
s = cv.add(s, 40)

img_new = cv.merge([h, s, v])
img_new = cv.cvtColor(img_new, cv.COLOR_HSV2RGB)

fig, ax = plt.subplots(2, 1, figsize= (10, 10))
ax[0].imshow(img)
ax[0].set_title('Original Image')
ax[1].imshow(img_new)
ax[1].set_title('Modified Image')
plt.show()
```



In []: # part (b)

```
import numpy as np
import cv2 as cv
import matplotlib.pyplot as plt

img = cv.imread('zion_pass.jpg')
img = cv.cvtColor(img, cv.COLOR_BGR2RGB)
img1 = cv.cvtColor(img, cv.COLOR_RGB2HSV)
h,s,v = cv.split(img1)
h = cv.add(h, 25)

img_new = cv.merge([h, s, v])
img_new = cv.cvtColor(img_new, cv.COLOR_HSV2RGB)

fig, ax = plt.subplots(2, 1, figsize= (10, 10))
ax[0].imshow(img)
ax[0].set_title('Original Image')
ax[1].imshow(img_new)
ax[1].set_title('Modified Image')
plt.show()
```

