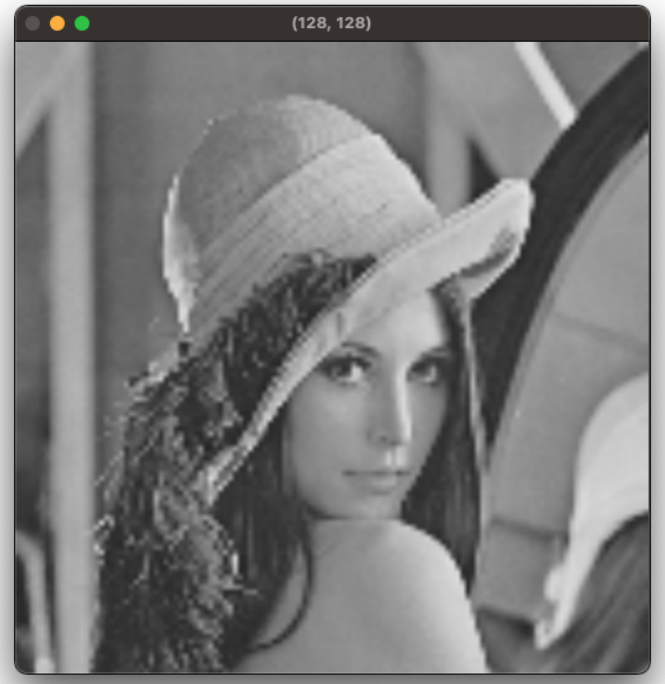
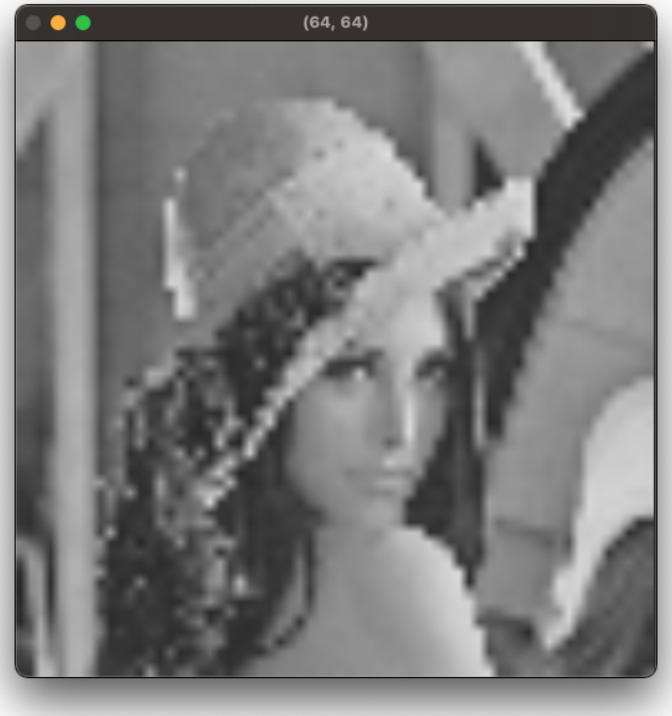
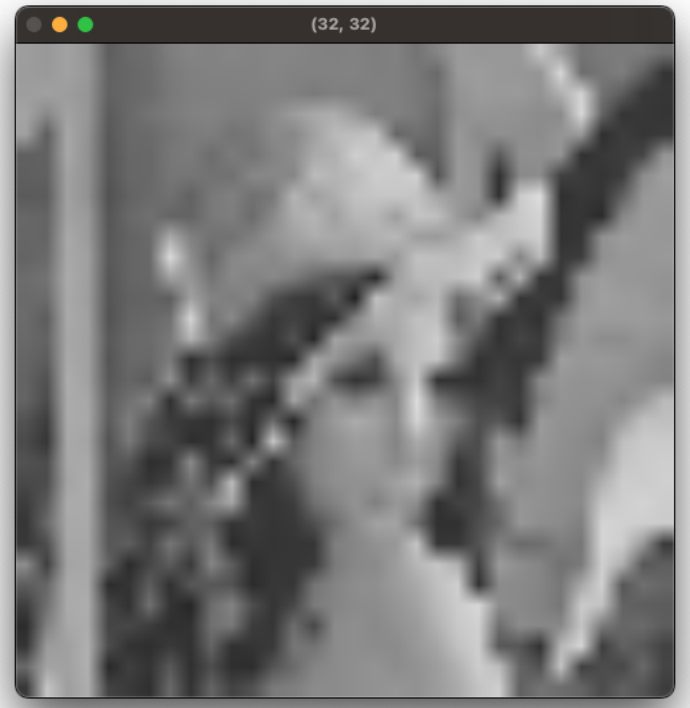
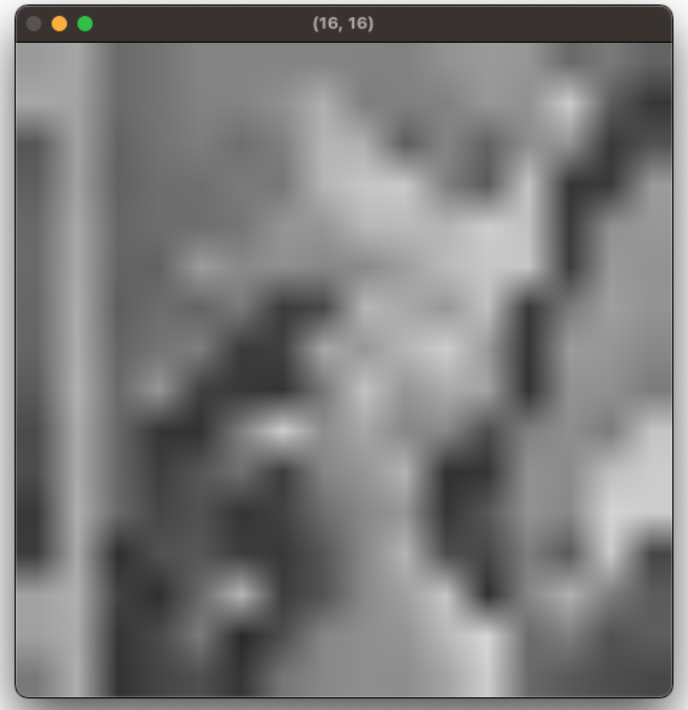
QUESTION 1

```python
"""
    CS20B1097 HIMANSHU

    1) Convert the given Lena image to grayscale image. Use the cv2.resize() to down sample
    the image with 4 sizes (128*128, 64*64, 32*32, and 16*16). Display the original image,
    and down sampled images with the same display size. Observe what happens.
"""

import cv2

img = cv2.imread('../Lena.png', 0)
cv2.imshow('Original Image', img)

height, width = img.shape[:2]

for i in range(4):
    res_img = cv2.resize(img, (16*(2**i), (16*(2**i))), interpolation=cv2.INTER_CUBIC)
    cv2.imshow(f'({16*(2**i)}, {(16*(2**i))})', res_img)

cv2.waitKey(0)
cv2.destroyAllWindows()
```


(128, 128)


(64, 64)


(32, 32)


(16, 16)

QUESTION 2

```python
"""
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    2) Down sample the grayscale Lena image with 8 different intensity ranges of values (0-255, 0-128, 0-64, 0-32, 0-16, 0-8, 0-4, and 0-2). (Note: Size of images are the same). And display all those 8 downsampled images in the same size display area on the screen. Observe what happens.
"""

import cv2
import numpy as np

img = cv2.imread('../Lena.png', 0)
cv2.imshow("Original Image", img)

max = np.max(img)
min = np.min(img)

img = (img - min)/(max - min)
new_img = np.uint8(img*255)
cv2.imshow(f"Image with Intensity range (0-255)", new_img)
for i in range(7):
    range = int(128/(2**i))
    new_img = np.uint8(img*range)
    cv2.imshow(f"Image with Intensity range (0-{range})", new_img)

cv2.waitKey(0)
cv2.destroyAllWindows()
```

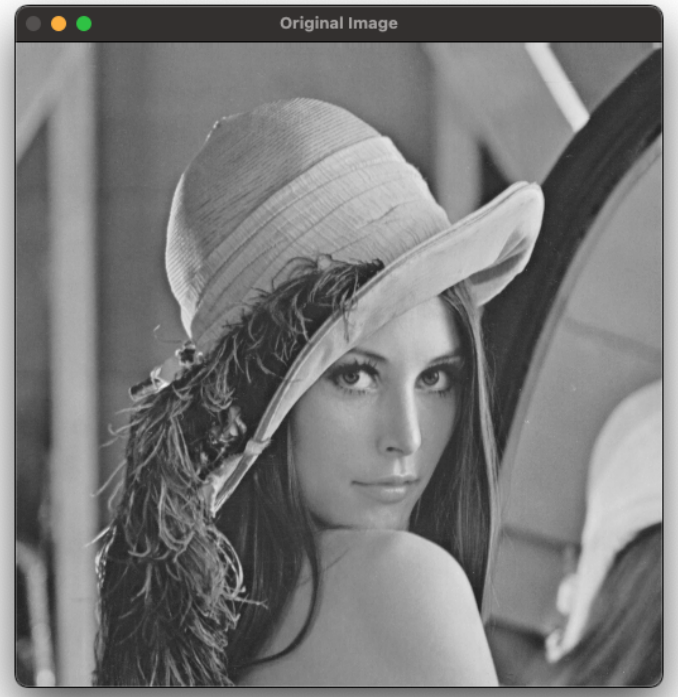
Original Image

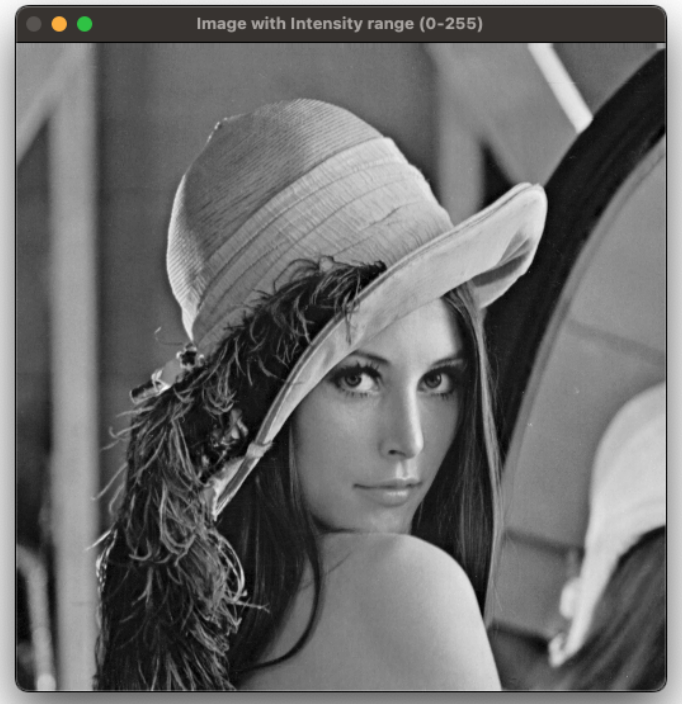
Image with Intensity range (0-255)

Image with Intensity range (0-128)

Image with Intensity range (0-64)

Image with Intensity range (0-32)

Image with Intensity range (0-16)

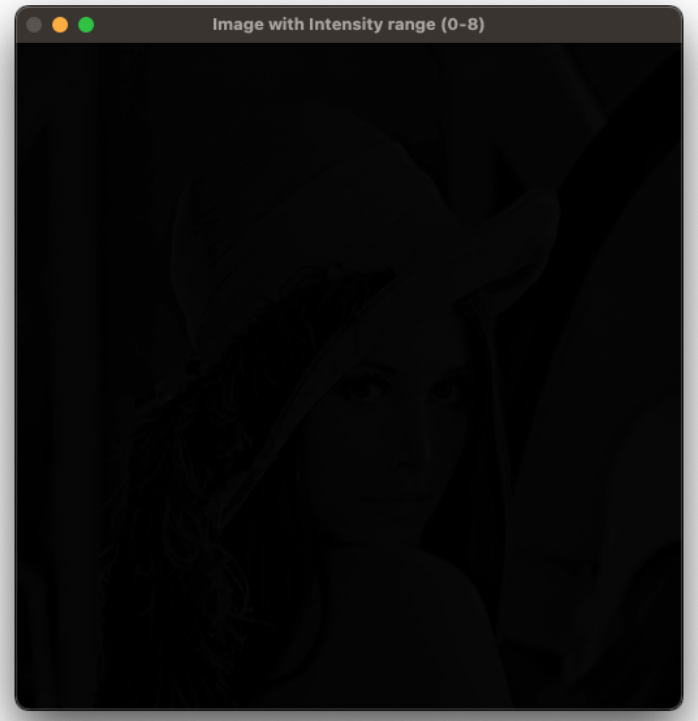
Image with Intensity range (0-8)

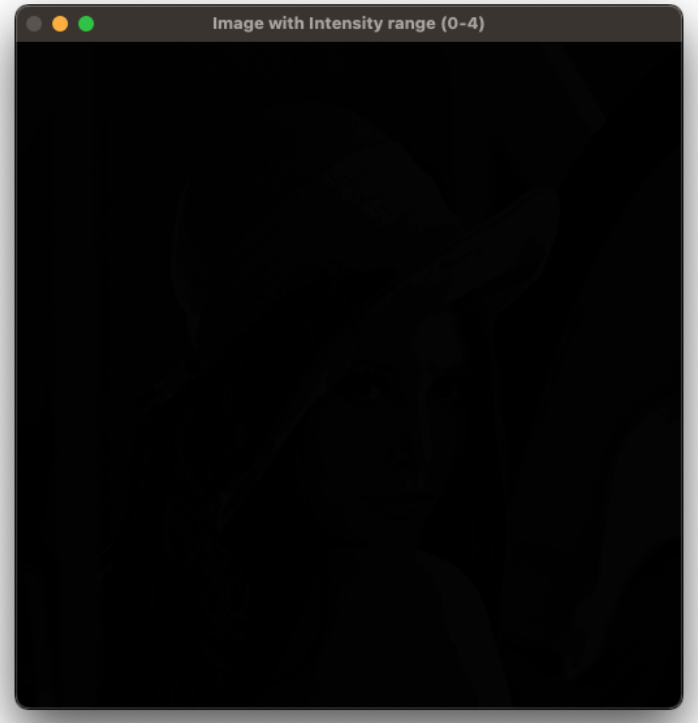
Image with Intensity range (0-4)

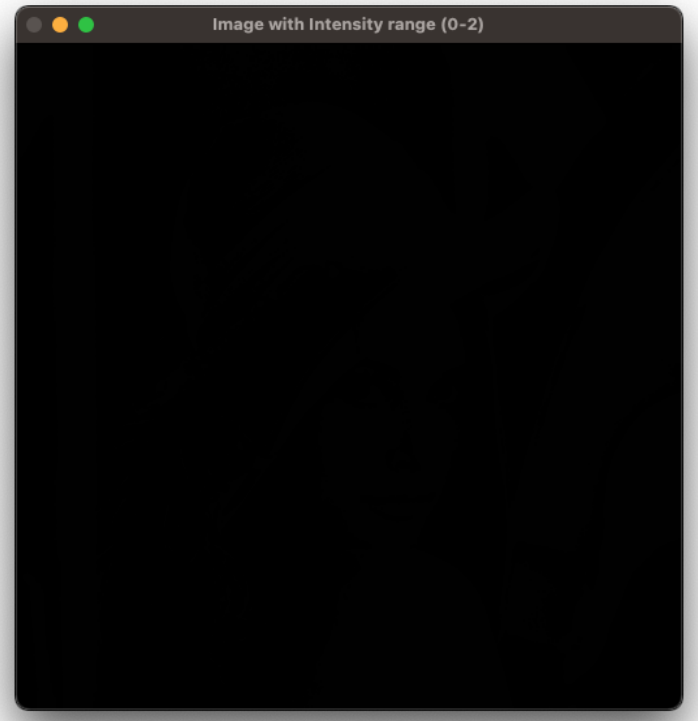
Image with Intensity range (0-2)