Task 1 :

1) Result of Laplacian using custom function vs OpenCV built-in function
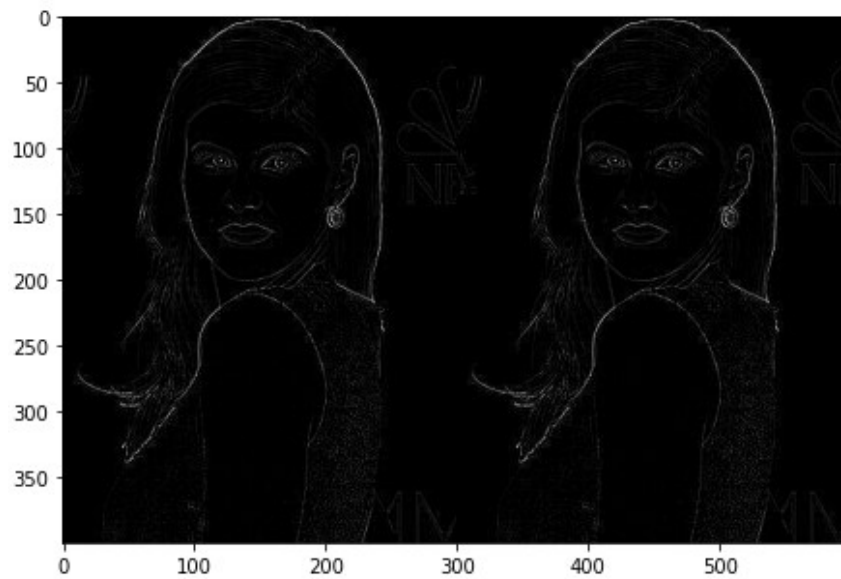
(a)   (b)   (c)
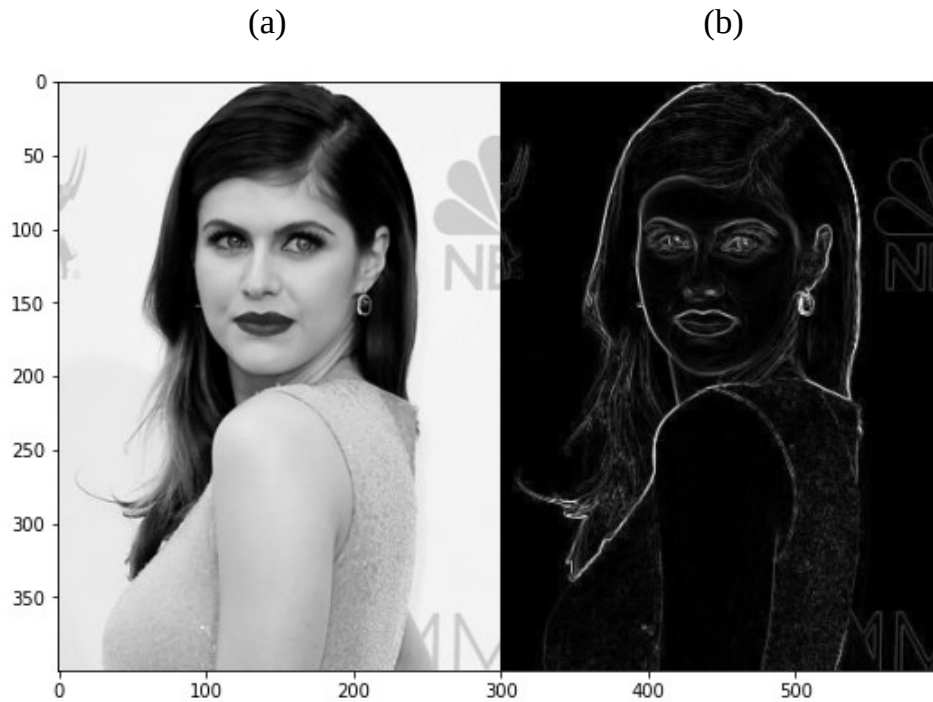

(a) - Laplacian image
(b) - Original image
(c) - Sharpened image - result of subtracting Laplacian with original image

Note:
In the above result, we have to subtract Laplacian with original image rather than adding, because the middle value of the Laplacian kernel is negative.
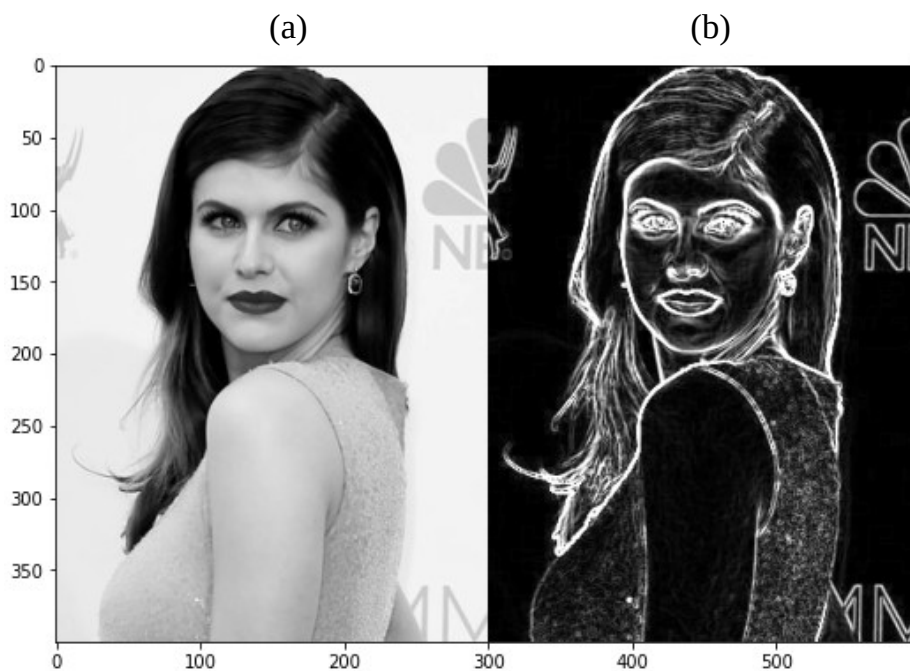
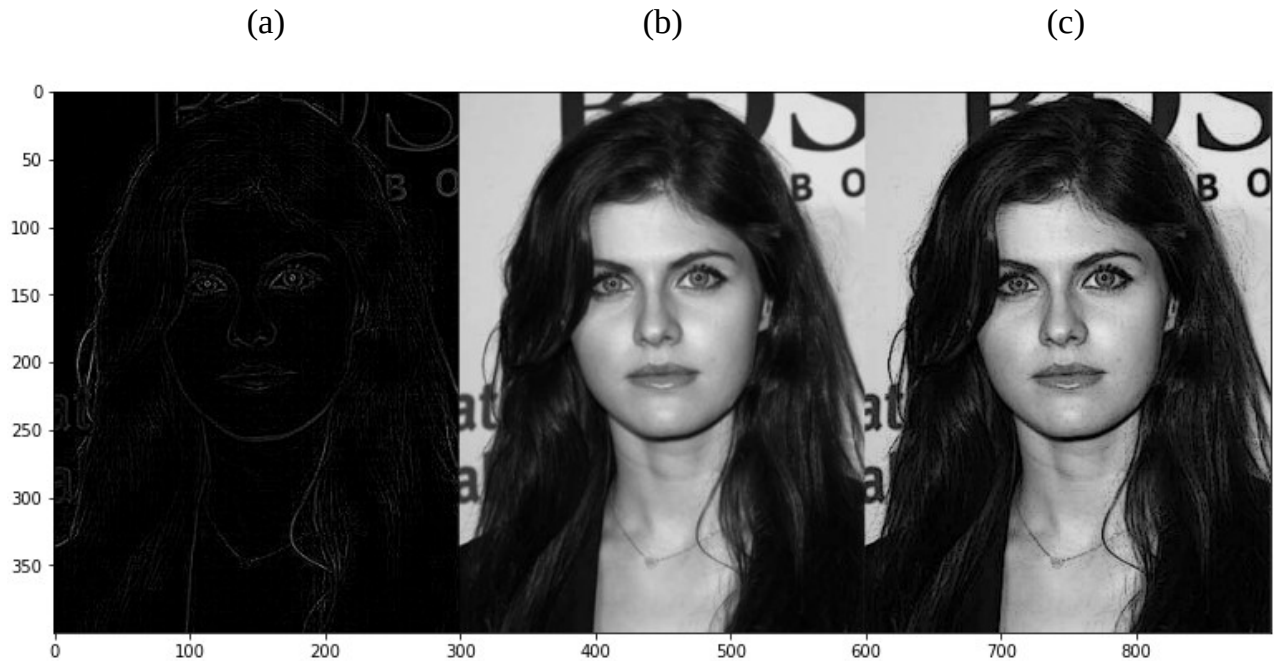## 2) Robert Cross operator

(a)   (b)

(a) – Original image
(b) – Result of Robert Cross operator

Sobel operator

(a)   (b)

(a) – Original image
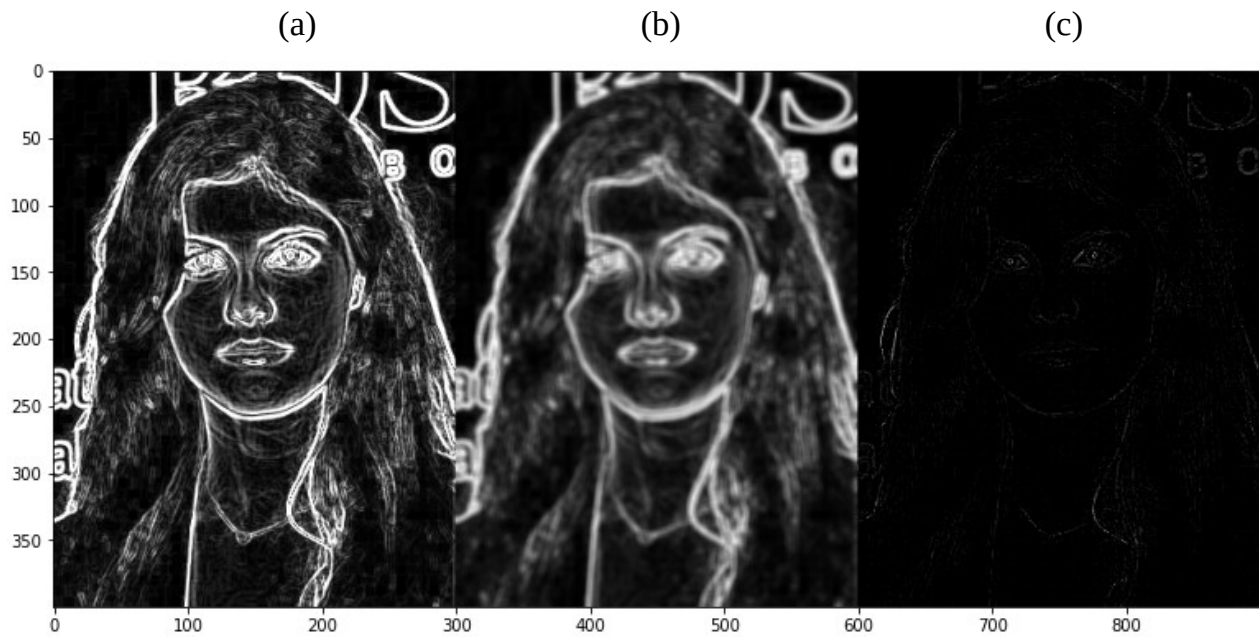(b) – Image after applying Sobel operator

Task 2 :

(a) - Laplacian image
(b) - Original image
(c) - Sharpened image - result of subtracting Laplacian with original image

Note:
In the above result, we have to subtract Laplacian with original image rather than adding,
because the middle value of the Laplacian kernel is negative.

(a) – Sobel filter
(b) – Sobel filter smoothed with 5x5 averaging filter
(c) – Result after masking Laplacian filter with smoothed Sobel filter
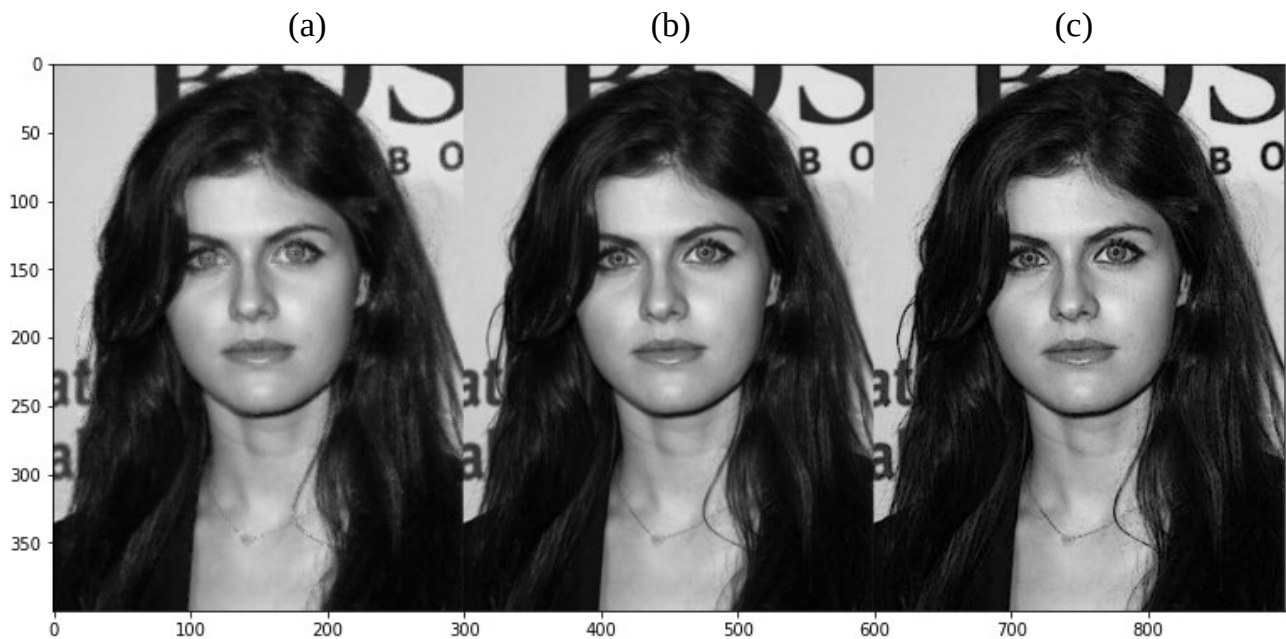
(a) – Added masked image with original
(b) – Original image
(c) – Subtracted masked image from original

As we can observe, subtracting masked image from the original image gives better sharpening results.
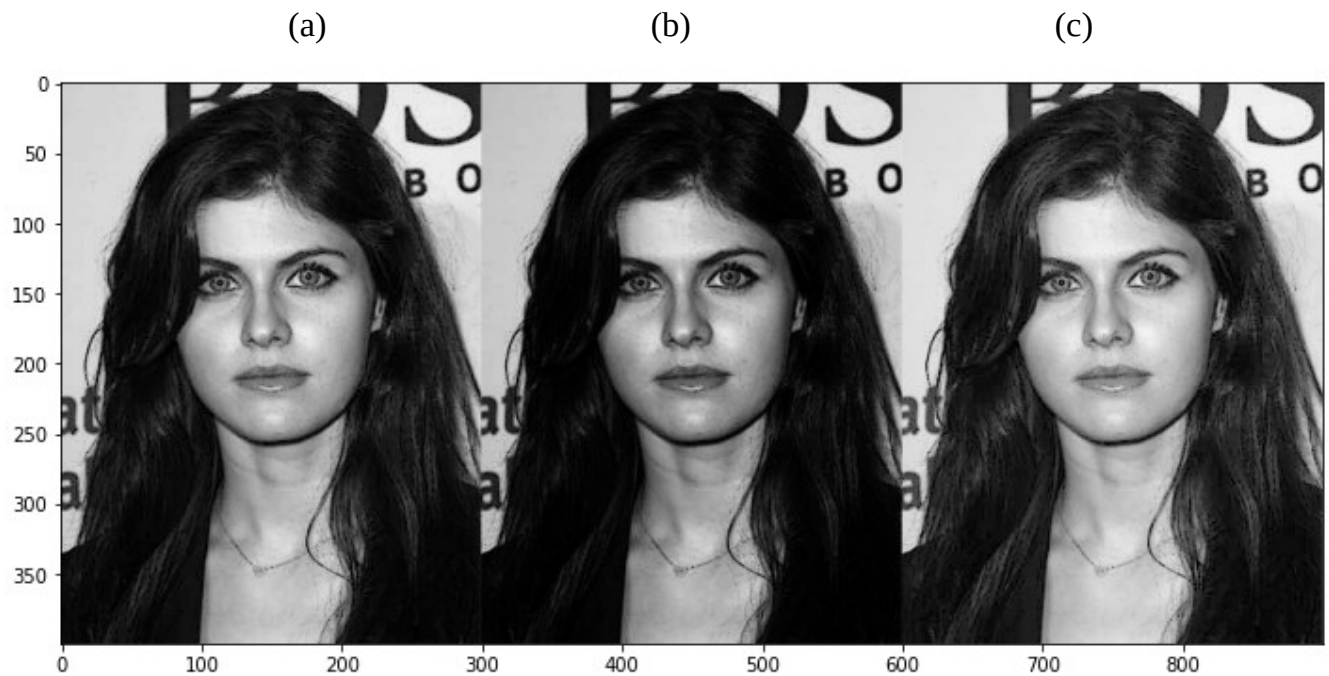
(a) – Masked image (Laplacian with smoothed Sobel)
(b) – Power law transformation with gamma = 1.3
(c) – Power law transformation with gamma = 0.8

We can see that gamma < 1 gives more brighter image.