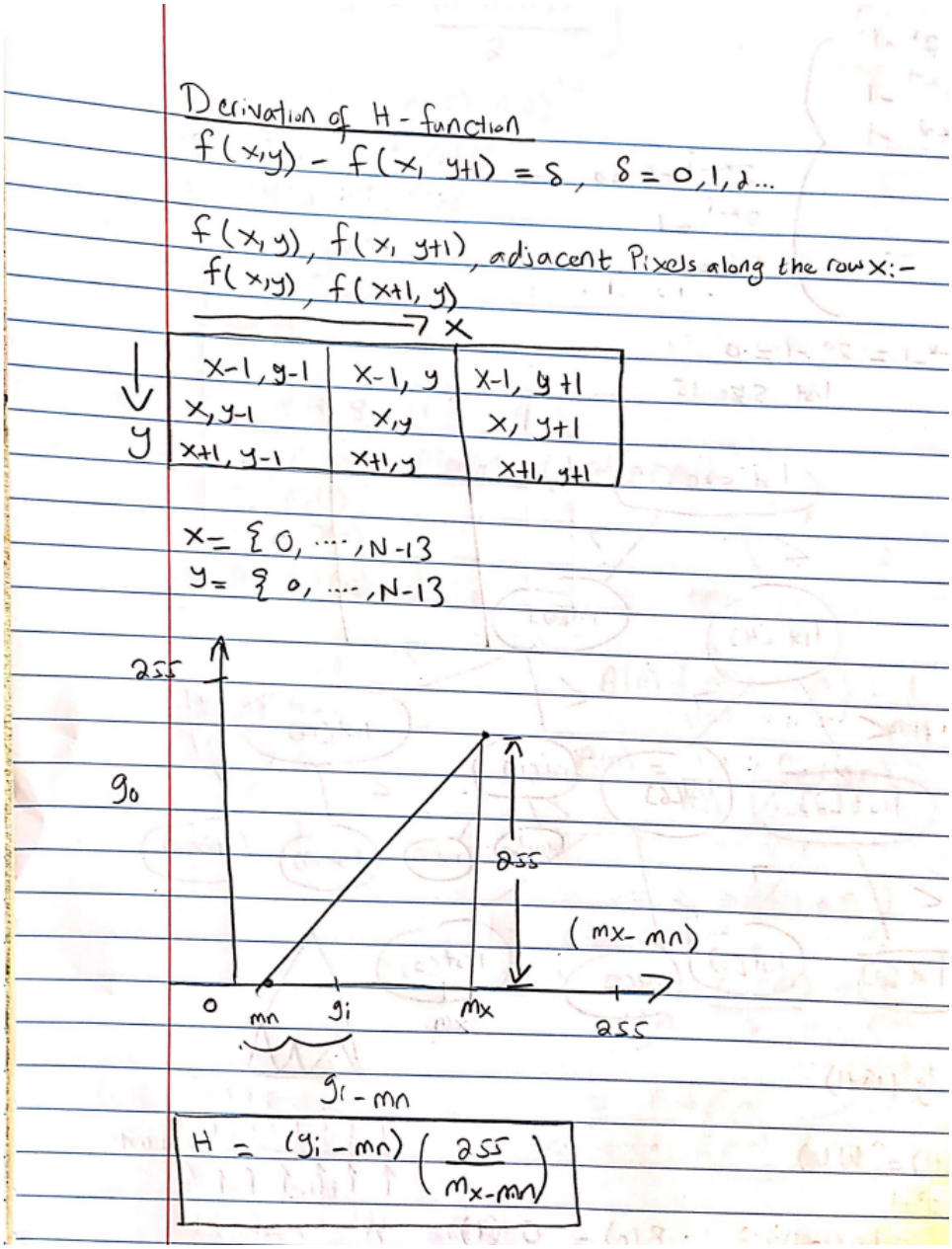
Problem Statement:

Use the image given in the following link to map the intensity to the full dynamic range of 0-255.

1. First find the min and max values from the image for one of the three bands (since it is gray level image all three bands will have same pixel intensities at a given location).
2. The intensity range can be mapped to full range (0-255) by a simple mapping function (H) which maps the input pixel intensity min to 0 and max to 255. Derive the mapping function and implement using python arrays and for loops.

H-Function Derivation:



COSC 719 Image Processing I Assignment 1

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The goal of this assignment is two fold:

1. First find the min and max values from the image for one of the three bands (since it is gray level image all three bands will have same pixel intensities at a given location).

2. The intensity range can be mapped to full range (0-255) by a simple mapping function (H) which maps the input pixel intensity min to 0 and max to 255. Derive the mapping function and implement using python arrays and for loops.

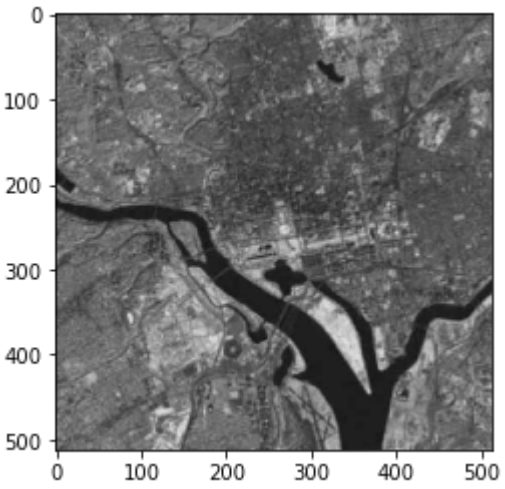
Problem 1

In [46]:
```
1 import numpy as np
2 import matplotlib.pyplot as plt
```

In [47]:

```
x = plt.imread('washdc512.jpg')
m,n = x.shape
print('imsize(m,n) = ', x.shape)
plt.imshow(x, cmap = 'gray')

mx = x[0,0]
mn = x[0,0]

for i in range(1,m):
    for j in range(1,n):
        if x[i,j] > mx:
            mx = x[i,j]
        if x[i,j] < mn:
            mn = x[i,j]

print('max = ', mx, 'min = ', mn)

```

```
imsize(m,n) =  (512, 512)
max =  95 min =  5
```



Problem 2

Pixel range is from 0 - 255

The entirity of dynamic range of brightness values are not being used

Dynamic range to change from 0 - 95 to 0 - 255

x[i,j] = (x[i,j] - min) * 255/(mx - mn)

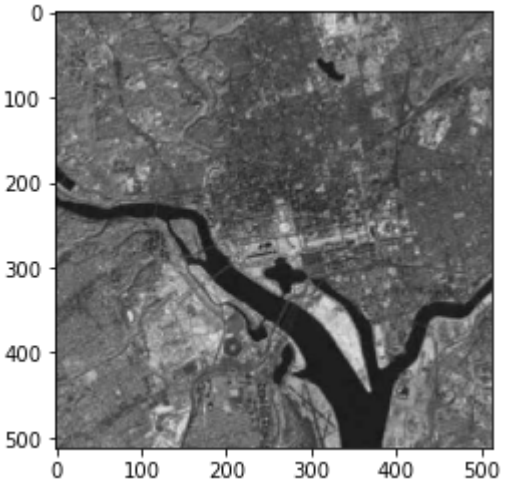
In [48]:
```
def minmax(x):
    m,n = x.shape
    mx = x[0,0]
    mn = x[0,0]
    for i in range(1,m):
        for j in range(1,n):
            if x[i,j] > mx:
                mx = x[i,j]
            if x[i,j] < mn:
                mn = x[i,j]
    return mx,mn
print('max = ', mx, 'min = ', mn)

```

```
max =  95 min =  5
```

In [49]:
```
def drange(x):
    m,n = x.shape
    x1 = np.zeros(shape = (m,n), dtype = 'uint8')
    for i in range(m):
        for j in range(n):
            x1[i,j] = np.uint8((x[i,j] - mn) * 255/(mx - mn))
    return x1

```

In [50]:
```
def main():
    x = plt.imread('washdc512.jpg')
    print('max, min = ', minmax(x))
    x1 = drange(x)
    print('new image max, min = ', minmax(x1))
    plt.imsave('newwash.jpg', x1, cmap = 'gray')
    plt.imshow(x1, cmap = 'gray')

if __name__ == '__main__':
    main()
```

```
max, min =  (95, 5)
new image max, min =  (255, 0)
```



Concluding Remarks:

Based on the images given below:

Figure demonstrating the differences in per pixel intensity after implementation of mapping function (H)

We can clearly see that implementation of intensity range from 0-95 to 0-255 by a simple mapping function H which maps the input pixel intensity from min = 0 to max = 255 resulted in a less blurry and a clearer image, we also notice that regardless of min and max values the pixel intensity in terms of blurriness will remain the same.