CE-712: Digital Image Processing of Remotely Sensed Data

Laboratory Exercise #6

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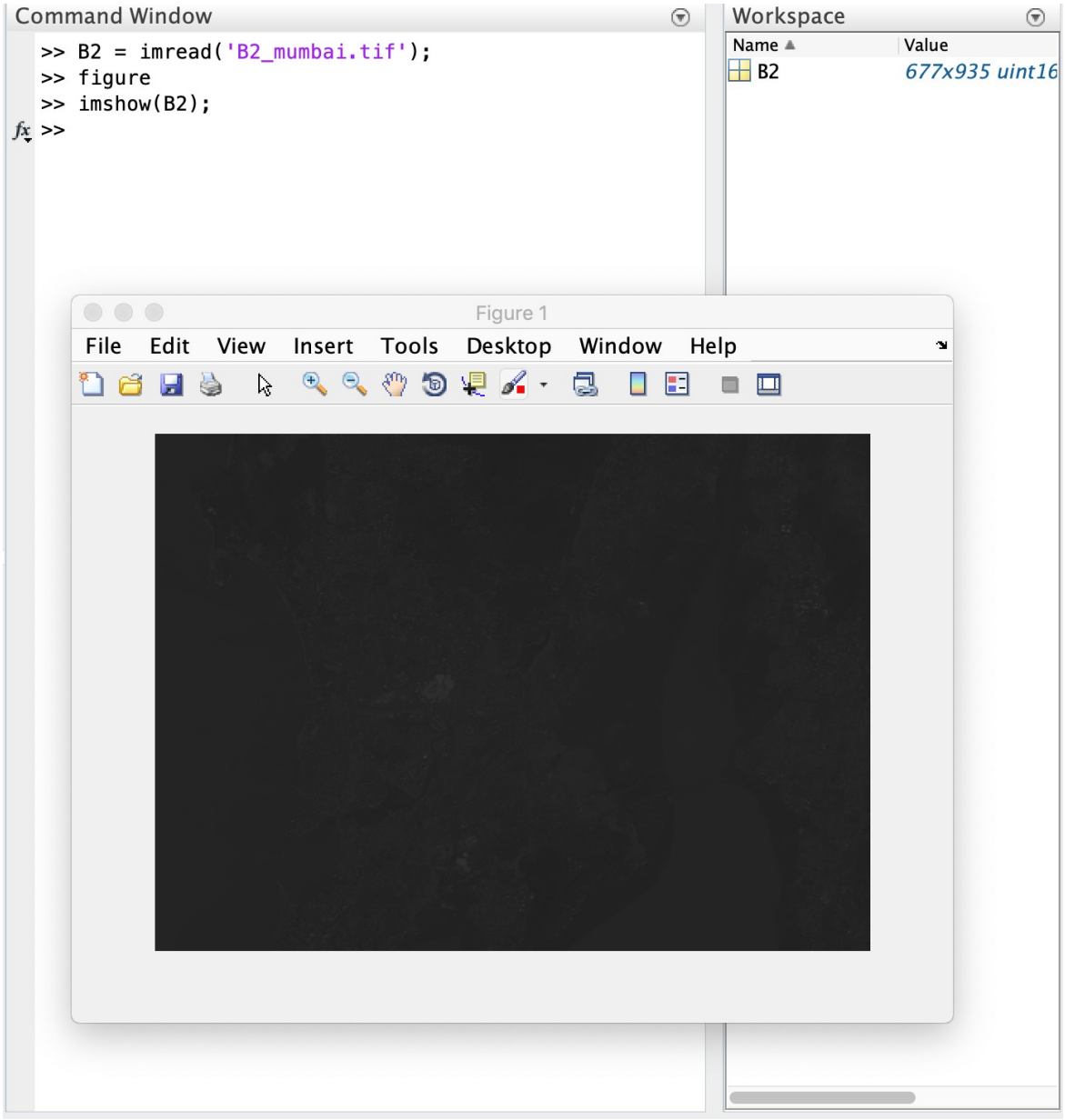
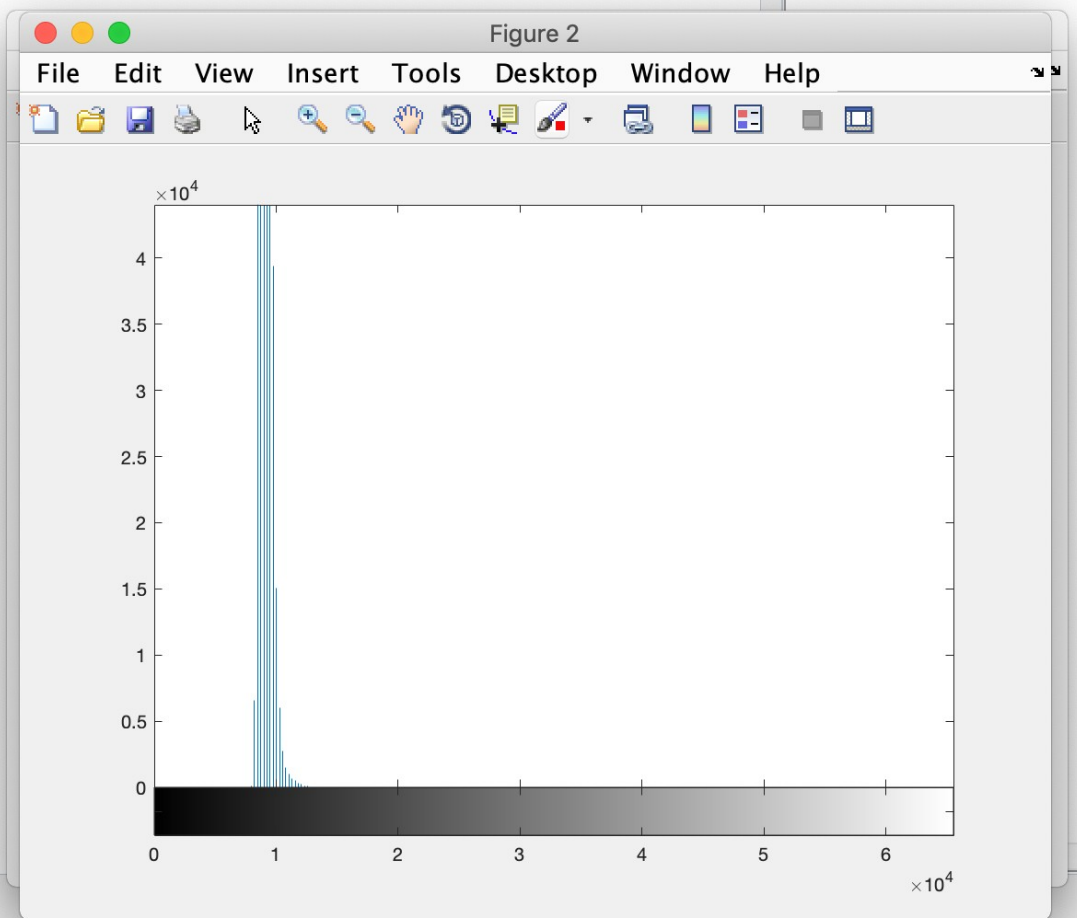
Contrast Stretching

Initial Image:

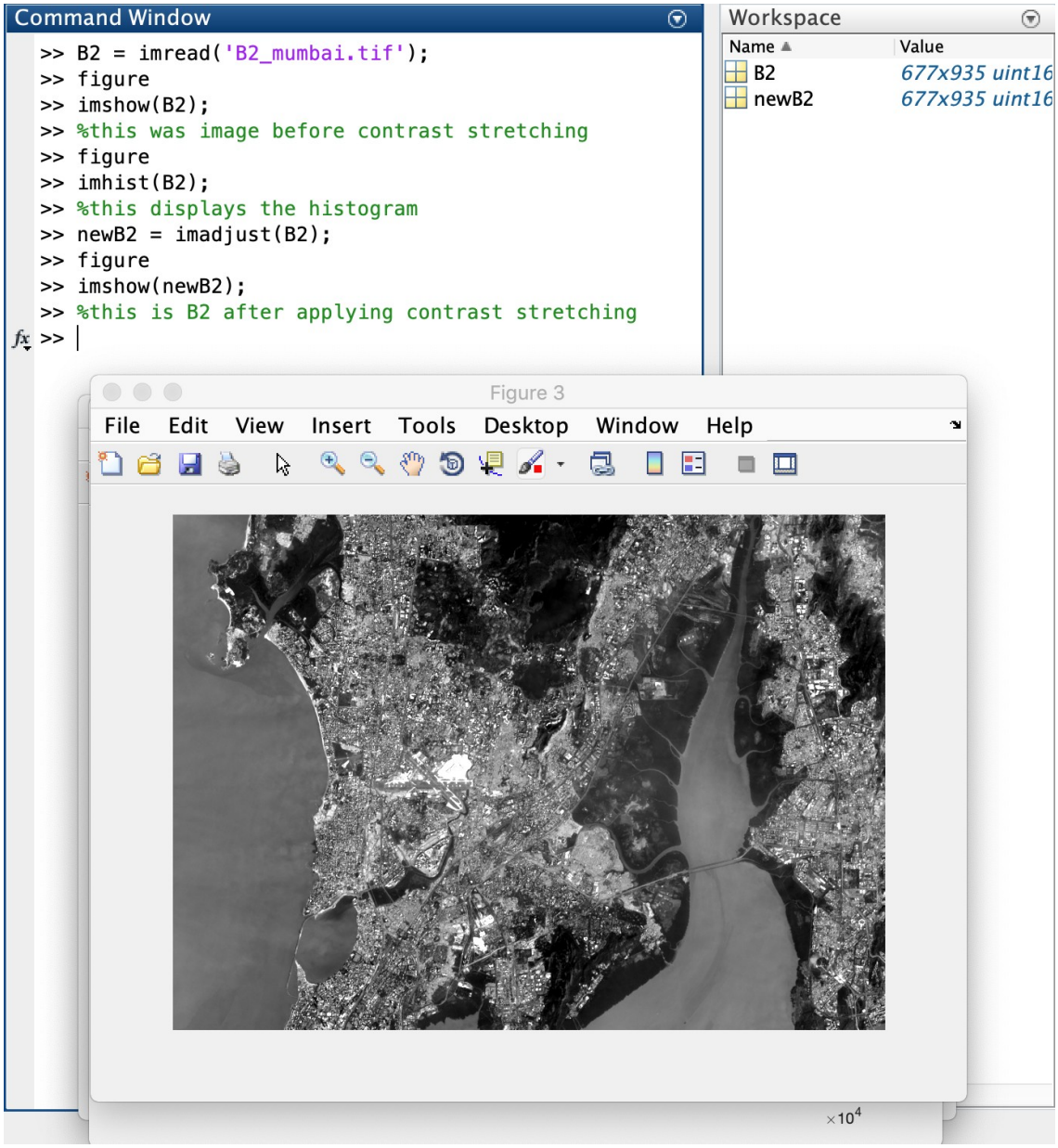


Initial histogram:

```
>> figure
>> imhist(B2);
>> %this displays the histogram
```

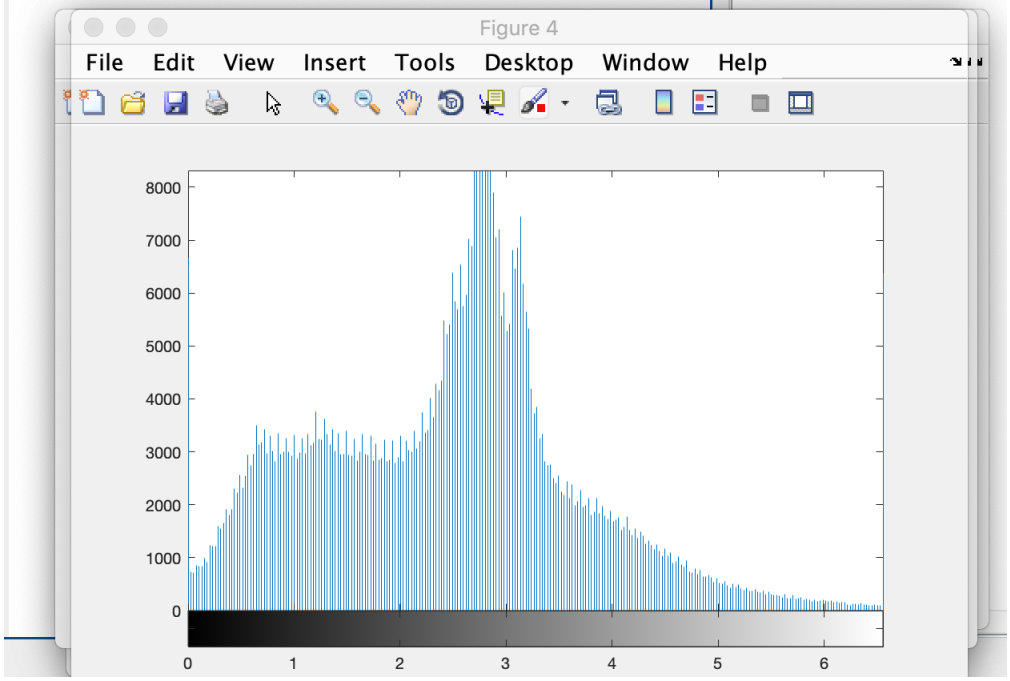


Applying contrast stretching:

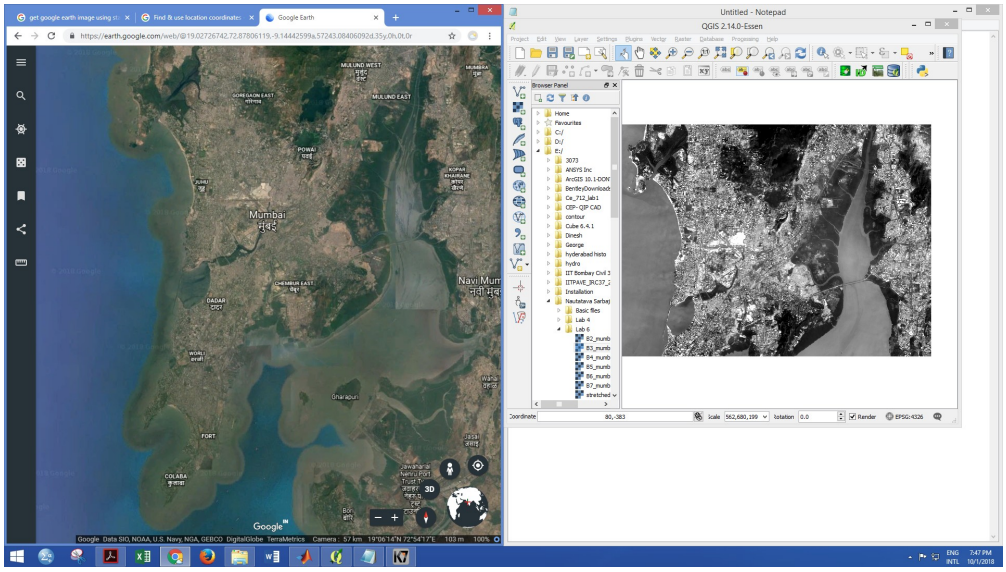


Final Histogram after contrast stretching:

```
>> figure
>> imhist(newB2);
>>
```



Google earth Image:



Q. Features in stretched contrast image:

- Airport
- Bridge
- Vegetation
- Sea
- Buildings

Q. DN Minimum as 5th percentile and DN Maximum as 95th percentile possible?

It is possible to get normalise a image taking 5th percentile as min and 95th percentile as maximum. In fact, sometimes while taking 1% we face a major problem that a single outlying pixel with either a very high or very low value can severely affect the value leading to very unrepresentative scaling.

It is then that we apply the given approach to first take a histogram of the image, and then select the limits at the 5th and 95th percentile in the histogram. This prevents outliers affecting the scaling so much.

Spatial Frequency of an image

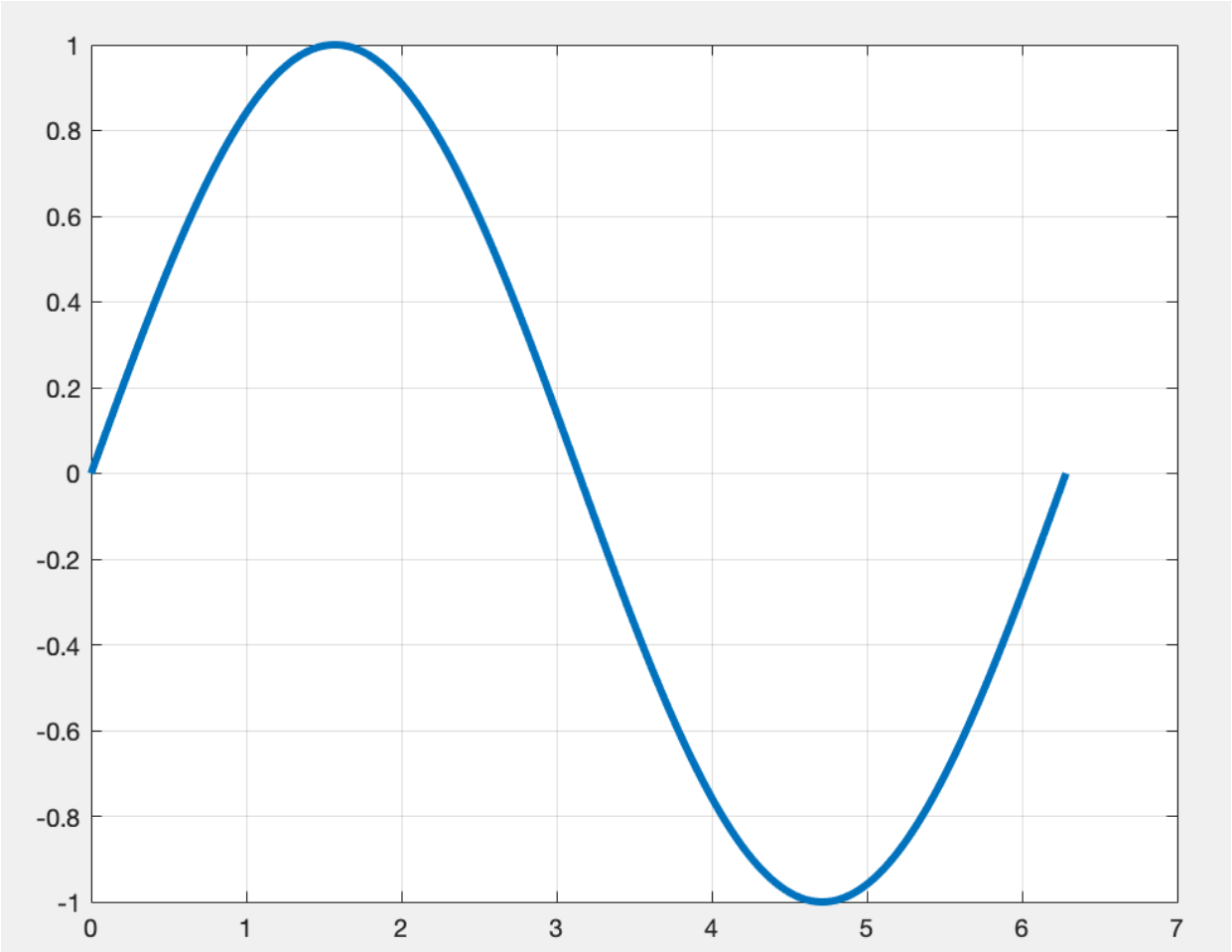
Low frequencies in images mean pixel values that are changing slowly over space, while high frequency content means pixel values that are rapidly changing in space.

Sin(x):

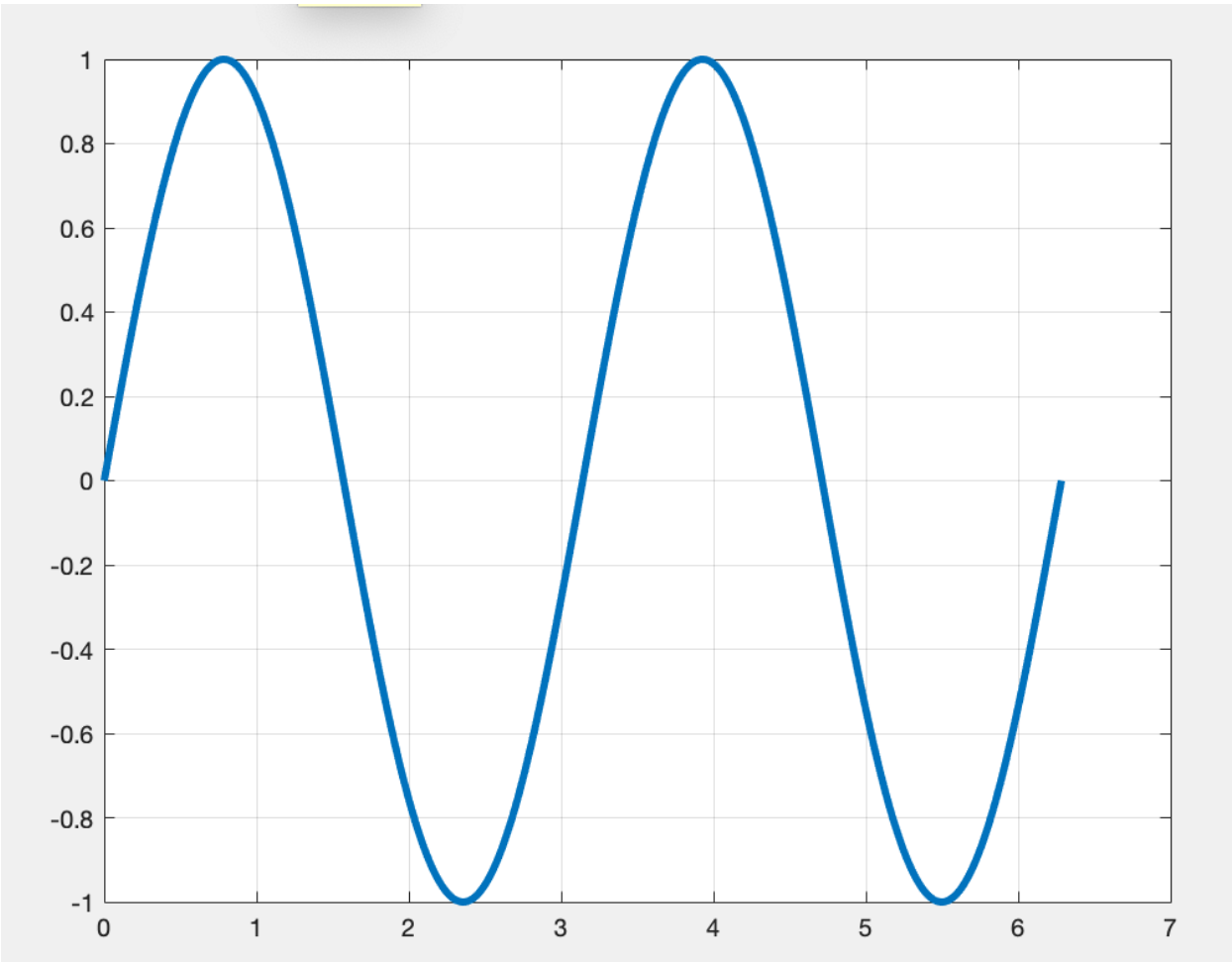
Sin(4*x):

2-D image:

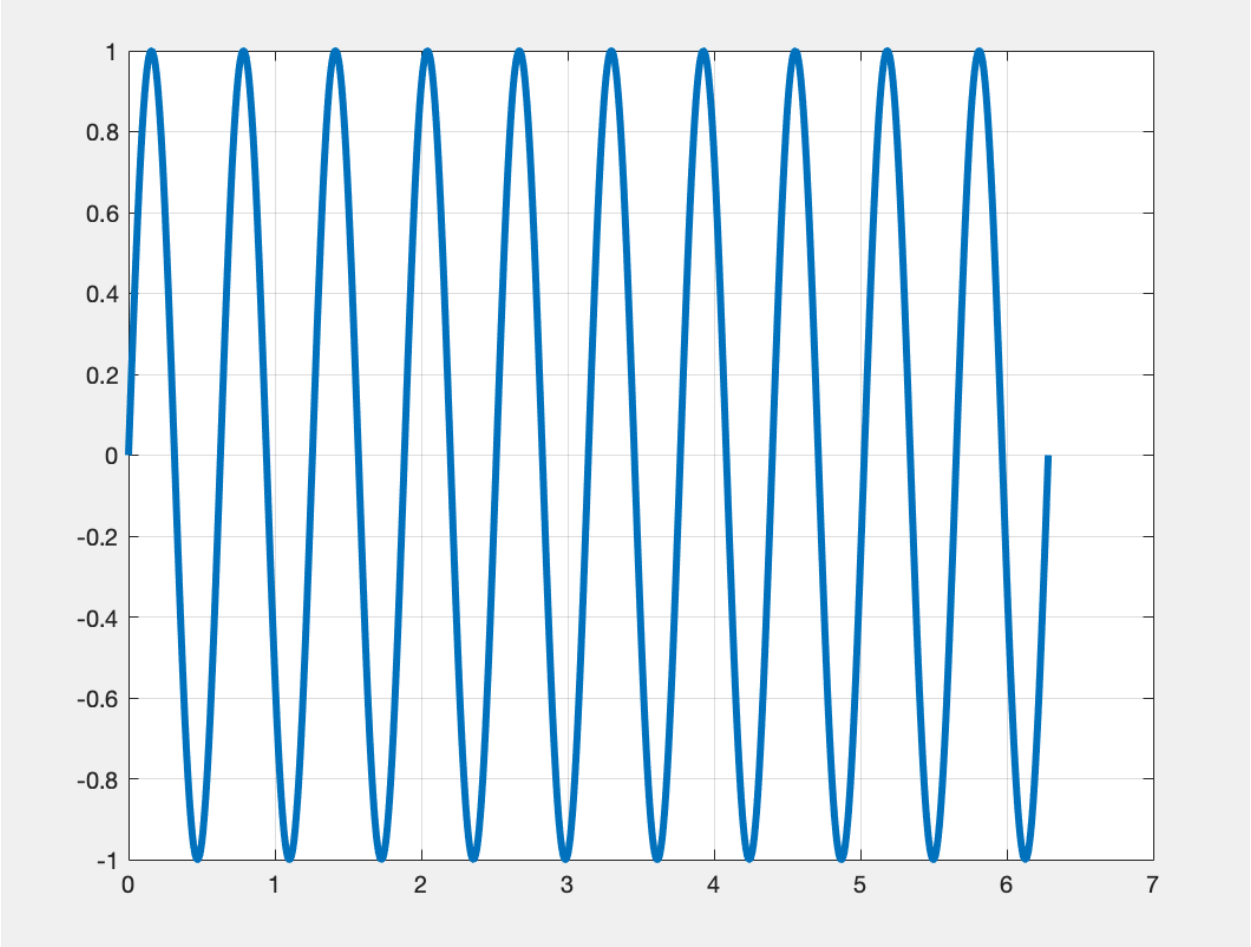
Sin(x)*sin(y):



Sin(2*x)*sin(2*y):



Sin(10*x)*sin(10*y):



We see that the number of repetitions in the same interval is increasing as frequency is increasing. Also, the wavelength of each wave is decreasing in x-direction. The amplitude of the wave is constant though in the entire figure. As we increase the number of numbers in interval, the smoothness of curve increases. This is because straight line length is getting less and multiple lines give a more curve effect.

Conclusion for the tutorial:

In this experiment, we learned that **Contrast stretching** (i.e normalisation) is a simple image enhancement technique that attempts to improve the contrast in an image by `stretching' the range of intensity values it contains to span a desired range of values. This pixel range may be complete or may be filtered such as taking a certain percentile or deducting a certain percentile from the set.

Also, we see that as we increase the frequency, the wavelength decreases and the number of repetitions increases.

A comparison between Sin(x)*sin(/y), Sin(2*x)*sin(2*y), Sin(3*x)*sin(3*y) can be seen in this image: