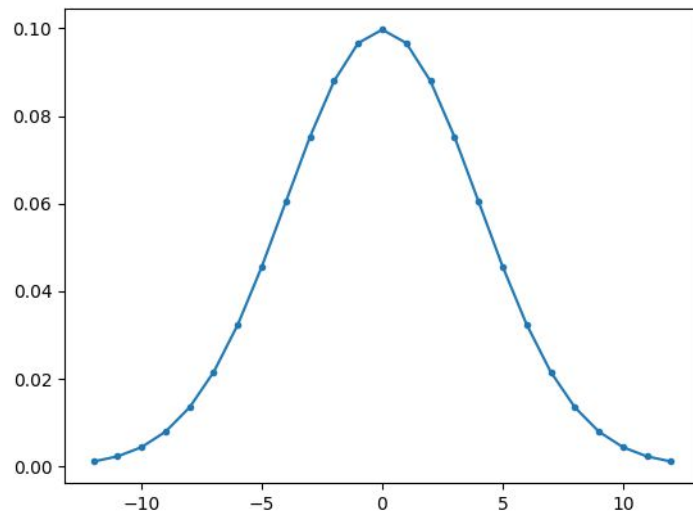Akshay Joshi - 2581346
Ankit Agrawal 2581532
Sushmita Nair 2581308
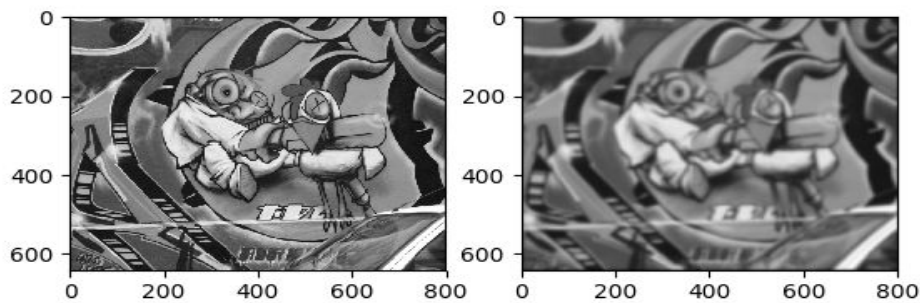
Question1

a)

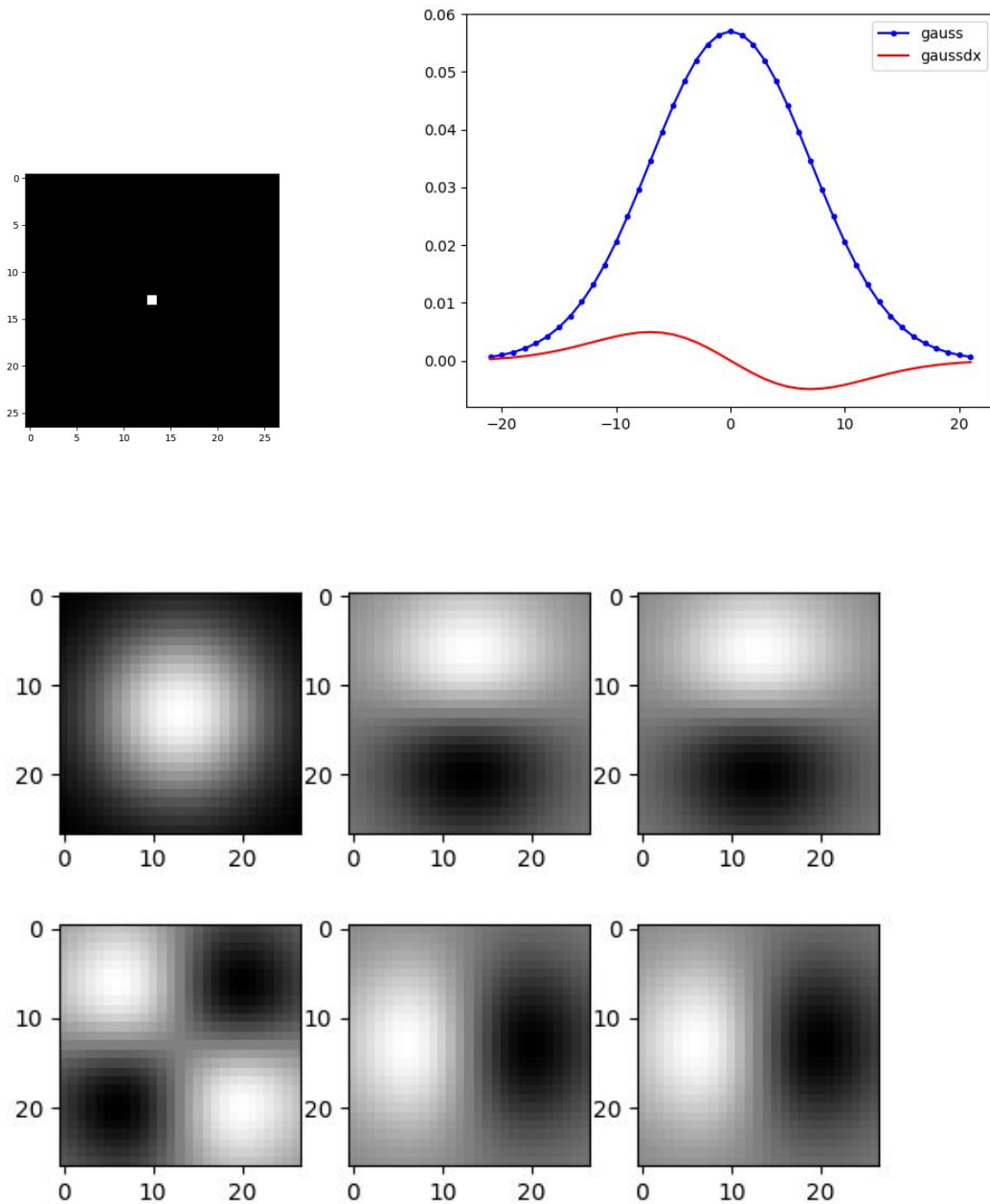Following is the plot f 1D gaussian kernel for sigma=4 in the range [-12,12]

b)

Using gaussian separability, the image is convolved first along y direction and then along x direction using 1D gaussian filter such that the image on the right has gaussian blur applied(sigma=4).
Gaussian blur removes high frequency components from the image.

c)

The first image has a 2D gaussian blur applied(generated using convolving the image with two 1D gaussian kernels in x and y directions).
Edges correspond to extrema of gaussian derivatives. Hence, Image 2 and 3 have been convolved with D transpose and hence shows intensity change in y direction. Image 4 shows intensity change in x and y direction since it is convolved with both D and D transpose. Image 5 and 6 are convolved with D and hence shows intensity difference along x.

d)
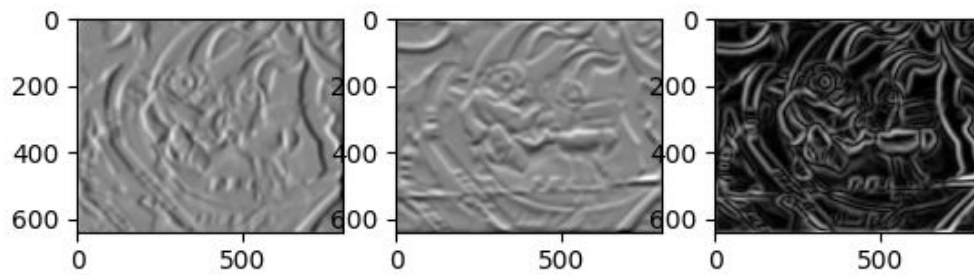
In the first image, the gaussian derivative is applied along rows(along x) and hence the image shows edges along x direction. In the second image gaussian derivative is applied along y and the edges along y are shown. The third image approximates the edges of the original image.

Question 2: Image Representations, Histogram Distances

The histograms generated through 'histogram_module.py' is comparatively similar to the ones generated via numpy.Histograms. Both the modules/packages generate histograms over a set of data. The parameters passed to both the functions are also identical which includes 'Number of Bins', 'Width', 'Range of the Data' and so on. The only major difference is that, in our custom 'normalized_histogram' python module, we unit normalize the generated histogram plot. Whereas, in numpy.Histogram, the normalization feature is deprecated as it produces incorrect results for unequal bin widths.

Question 3: Object Identification:

For number of bins: 30
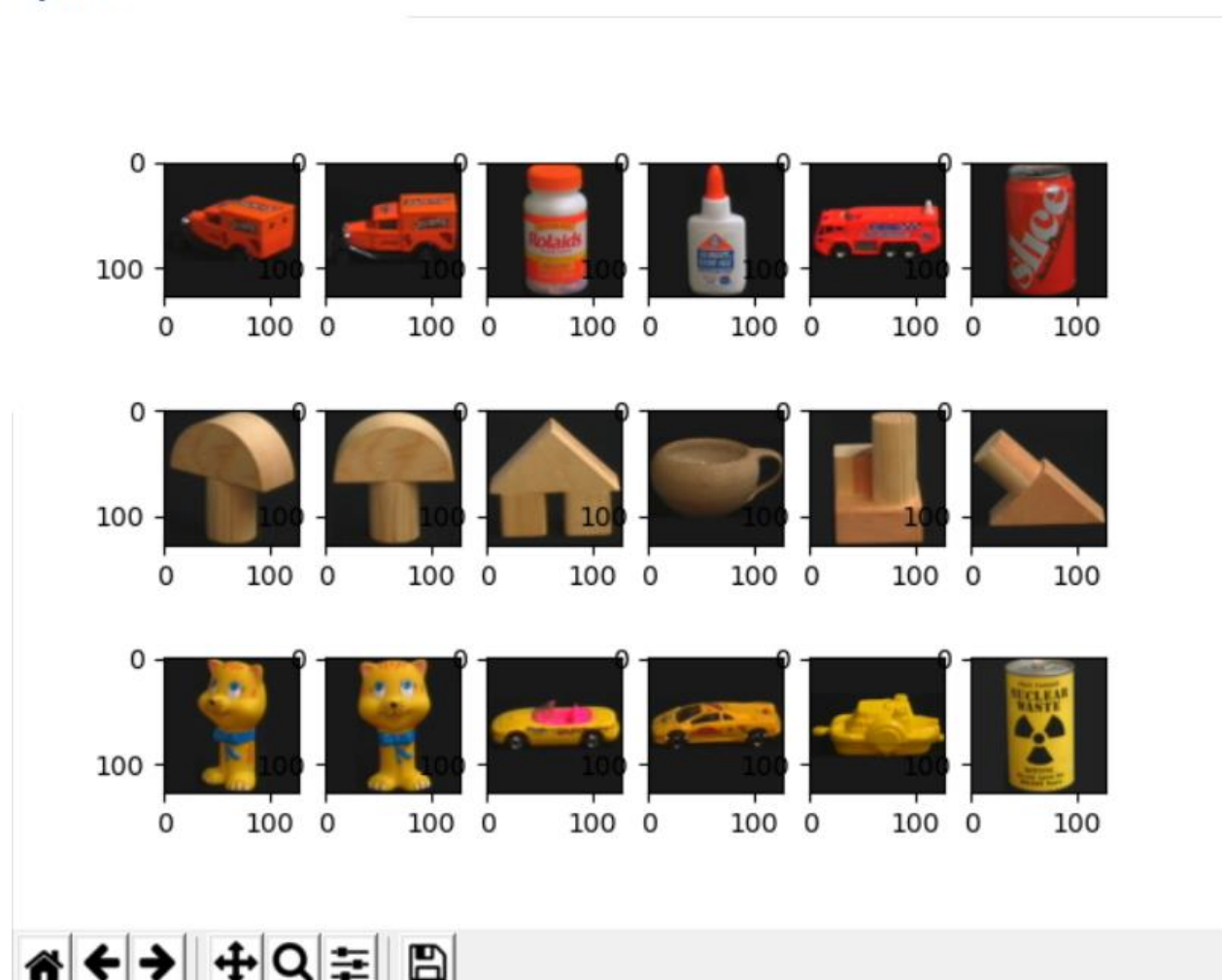
number of correct matches: 79 (0.887640)

for no of bins = 10