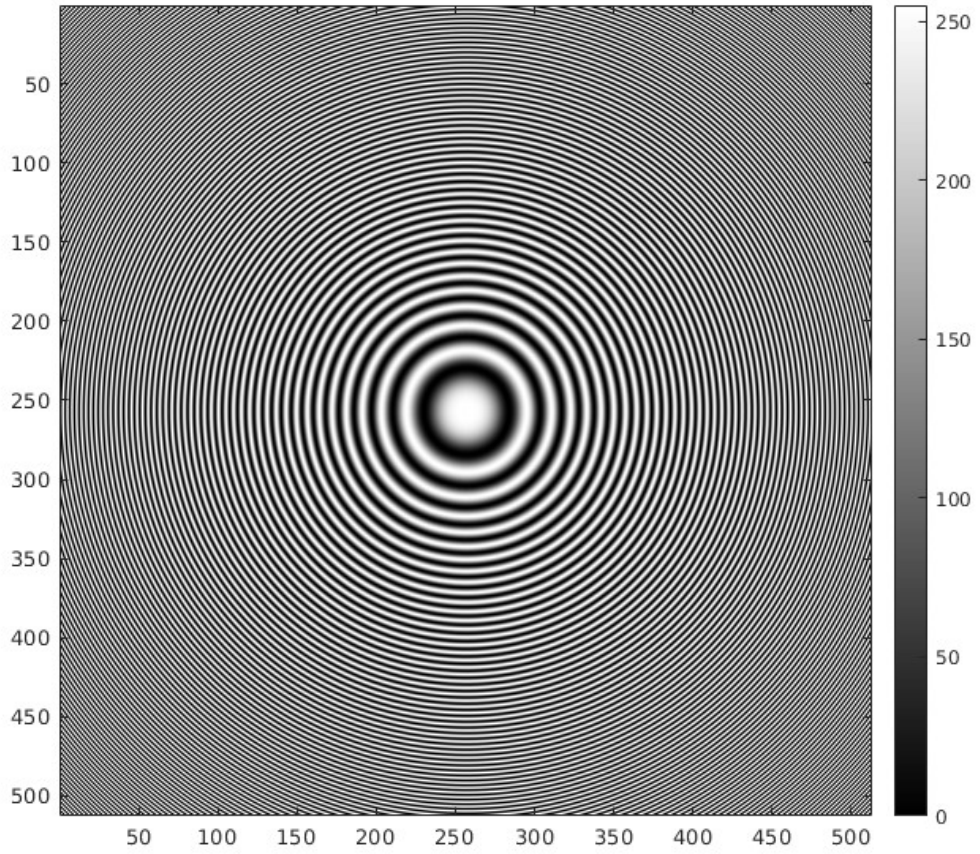
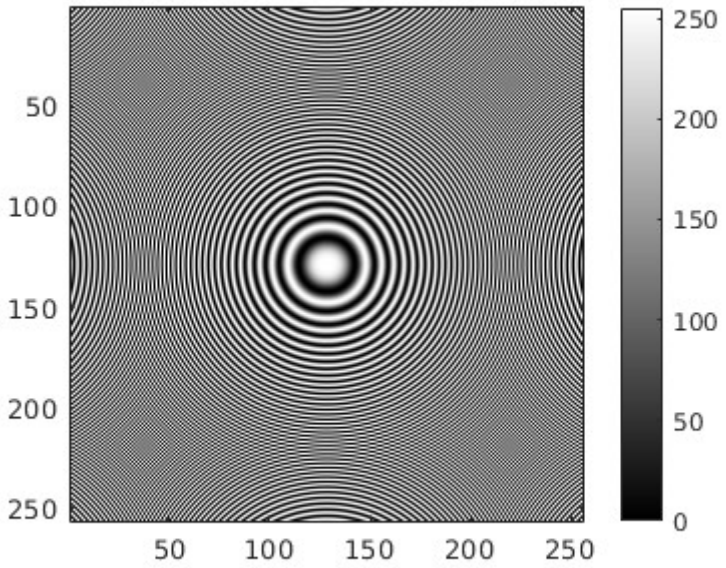
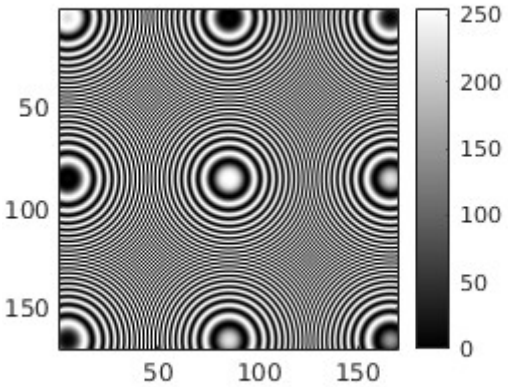
Q1 (a) Original image



Shrunk by d=2



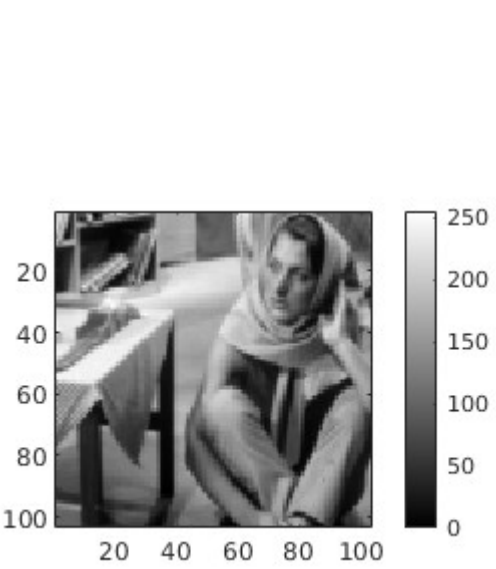
Shrunk by d=3

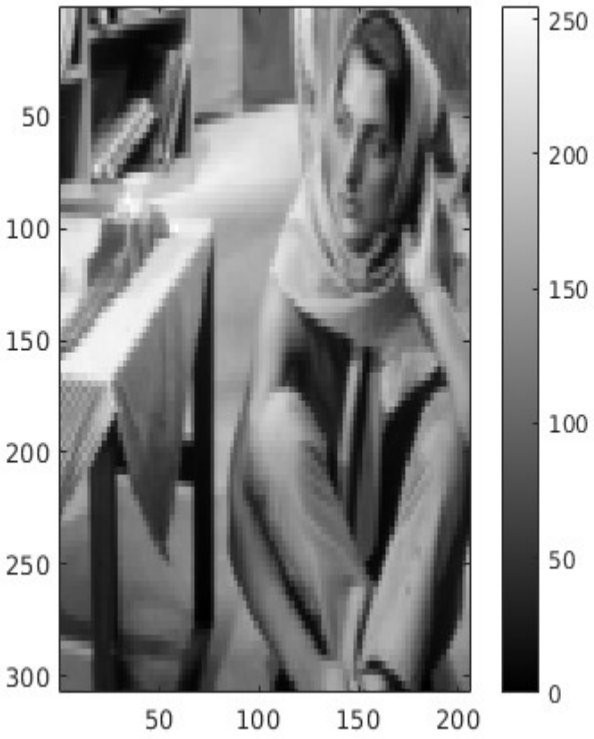


The appropriate scale has been mentioned on the axes.
Observation : The Moire patterns begin to appear at d=2 and are much more prominent at d=3

Q1 b.) Original Image (left) vs Bilinear Interpolated enlarged Image (right)

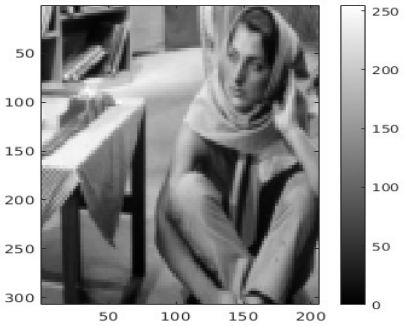
The appropriate scale has been mentioned on the axes.

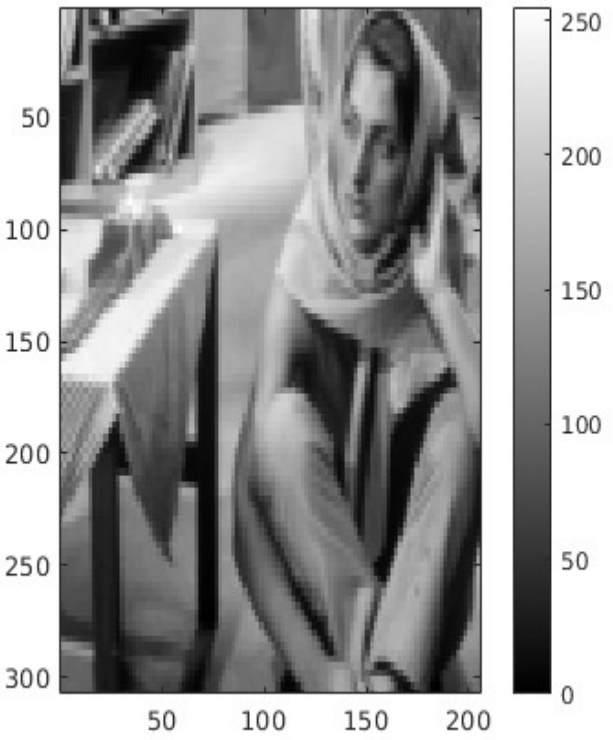




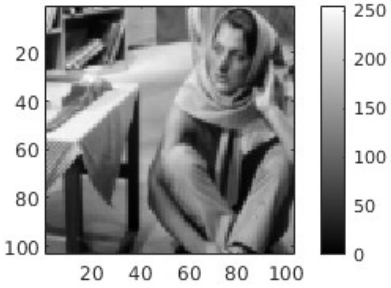
Q1 c) . Original image (left) vs Nearest Neighbours interpolated enlarged image (right)

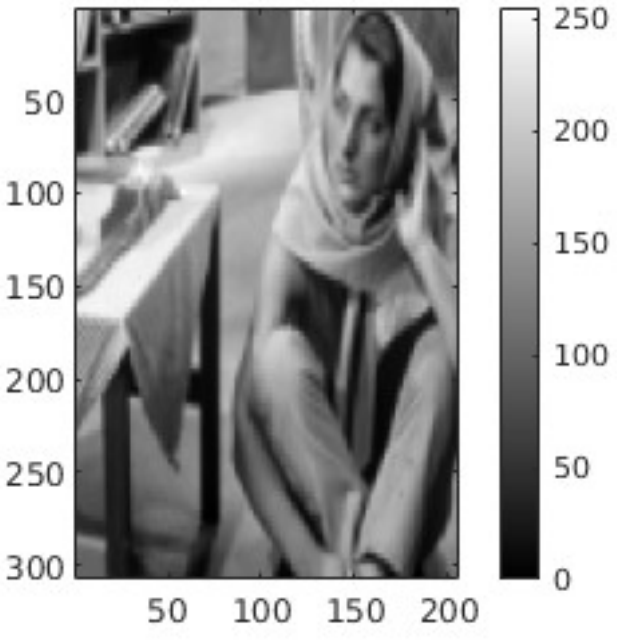
The appropriate scale has been mentioned on the axes.



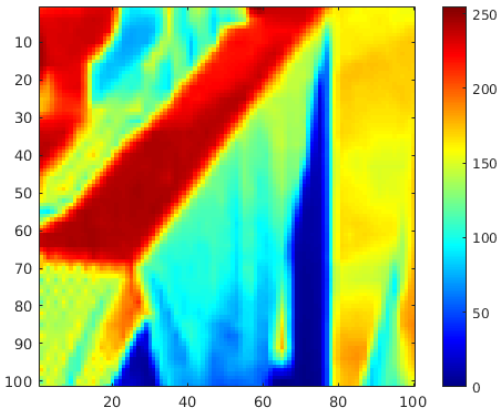


Q1. d) Original image (left) vs Bicubic Interpolation enlarged image (right)
The appropriate scale has been mentioned on the axes.

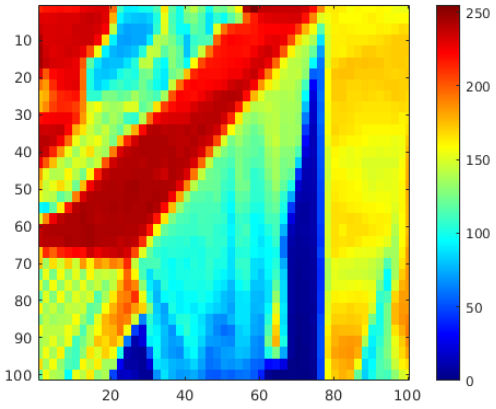




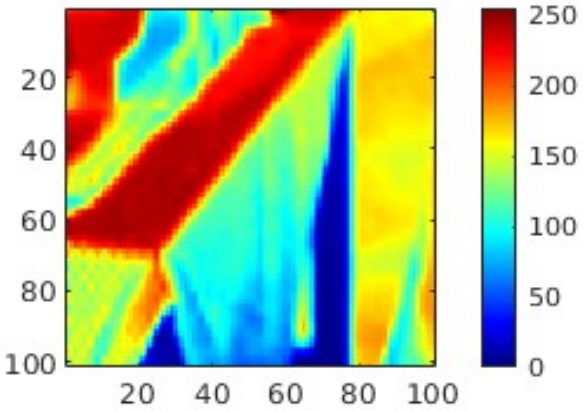
Q1 (e) A small chosen region in the images resized using the 3 different interpolation methods,



a) Bilinear



b) Nearest Neighbours

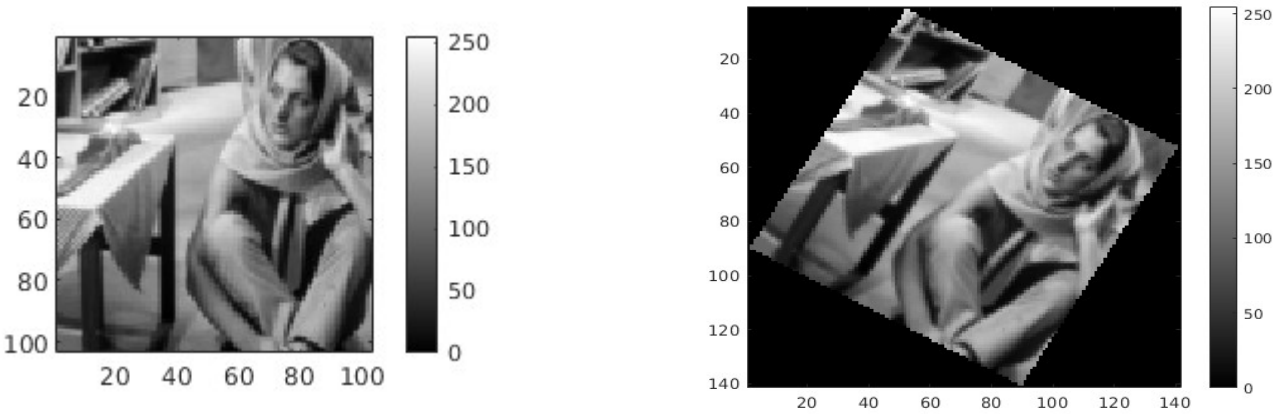


c) Bicubic

Observation: Clearly the Nearest Neighbour interpolated image is less smoother than the Bilinear Interpolation which in turn is slightly less smoother than the Bicubic interpolation

Justification: Since the interpolation function used in NN interpolation is discontinuous while we use continuous interpolation functions for Bilinear as well as continuously differentiable functions for Bicubic interpolation...their smoothness increases in that order

Q1 f) Original image (left) vs Rotated image (30 deg clockwise) (right)



The Bilinear interpolation technique has been utilised to get values for unknown points which get mapped to the integer coordinates of the rotated image.

In addition :
It was observed that the publish feature of MATLAB seemed to be resampling and reshaping images in some cases as compared to when the code was run individually for each sub question. Due to this slight modification of sizing had to be done to get back the correct shape of images...

The corresponding saved MATLAB .mat files in the images folder are as follows:

Q1 a – image_1a_d2.mat and image_1a_d3.mat
Q1b - image_1b.mat
Q1c - image_1c.mat
Q1d - image_1d.mat
Q1e - image_1e_1.mat & image_1e_2.mat & image_1e_3.mat
Q1f - image_1f.mat