Homework Assignment - 1

(1) Consider the following problem as a continuous gray level case. The maximum gray level is 255 and the given image has the following gray level distribution function (continuous case histogram):

\[ H_f(f) = 1704 \sin\left( \frac{\pi f}{255} \right) \]

(a) Sketch the histogram (distribution function). What is the total area of the image?
(b) Derive expression for the transformation curve that will achieve histogram equalization on this image. Sketch the curve.
(c) Show that the histogram of the transformed image actually does have uniform distribution (constant gray levels between 0 and 255).
(d) If this same transformation curve that you have derived were to be applied to a different image, would you still expect an equalized histogram for the output image? Justify your answer.
(e) Determine the cumulative distribution function of the output image and sketch it.

(2) Consider the image in problem 1 of homework 4, after it has gone through quantization process. You have already calculated its histogram values in that problem. The gray levels range from 0 to 31. Build the discrete look-up table that will perform histogram equalization on this image. Sketch the histogram of the transformed image and also its cumulative histogram.

(3) Generate the two dimensional histogram from the mulispectral (RED and BLUE) 8x8 image supplied.
(a) Confirm that the relationship between the total number of pixels in the image and the number count in all of the bins of the two dimensional histogram
(b) Identify the center location of the two clusters (call them A and B) in the two dimensional histogram.
(c) If an unknown object in a given image has RED pixel value of 2 and BLUE pixel value of 3. You are told it belongs to either class A or B. Determine which class it actually belongs.