Problem 1 (Dithering)

Part A: *Dithering implementation in Processing*

Define the mean squared error per pixel, MSE, between two grayscale images of the same size, I1 and I2, as the following

$$\text{MSE} = \frac{1}{total\ \#\ of\ pixels} \sum_{over\ all\ pixels\ locations\ (n1,n2)} [I_1(n1,n2) - I_2(n1,n2)]^2$$

Write a script in `setup()` built-in function in Processing that loads a grayscale image and applies to it the four dithering techniques, we learned in class, displaying the dithered image each time and printing the MSE between the original image and the dithered image.

a) Write a function `thresh_dither` in processing that takes a PImage object and returns the dithered image as a PImage object too. This function must apply threshold dithering assuming 8-bit grayscale images.

b) Write a function `rand_dither` in processing that takes a PImage object and returns the dithered image as a PImage object too. This function must apply random dithering assuming 8-bit grayscale images.

c) Write a function `pattern_dither` in processing that takes a PImage object and returns the dithered image as a PImage object too. This function must apply pattern dithering assuming 8-bit grayscale images. The dither mask is just the one we had in class.

8	**3**	**4**
6	**1**	**2**
7	**5**	**9**

d) Write a function `errDiff_dither` in *Processing* that takes a PImage object and returns the dithered image as a PImage object too. This function must apply error diffusion dithering assuming 8-bit grayscale images. Use the Floyd-Steinberg algorithm explained in class.

e) Save the posted image "image1.jpg" and use it as an input to your code. Compare the outputs of all the dithering algorithms and comment on the corresponding error figures, MSE, you computed. Include in your report snapshots of the dithered output images.