Math 77A Project 2 (Due January 17)

Instructions: This project will require some MATLAB code. Please submit your solution as an `.m` file. When turning in the project, name your file `project2_yourlastname.m` and email it to `eesser@uci.edu`. If you are submitting multiple files, please zip them together in a file named `project2_yourlastname.zip`.

1. Write a MATLAB function `quantize.m` that takes in a grayscale image f and a specified number of gray levels L and returns a quantized approximation of f that only has L distinct intensities $0, 1, 2, ..., L-1$.

Download an image of your choice, read it into MATLAB and convert it to a grayscale image f. Define q by `q = quantize(f,L);` using the function you wrote. Then compare the images and their histograms by typing:

```
subplot(2,2,1); imagesc(f); colormap gray
subplot(2,2,2); imagesc(q);
subplot(2,2,3); hist(f(:),255);
subplot(2,2,4); hist(q(:),255);
```

2. Write a function `downsample2.m` that crudely downsamples a grayscale image by selecting only the pixels with odd row and column indices. Choose an image with some textured content. Read it into MATLAB and convert it to a grayscale image f. Define $f2$, $f4$ and $f8$ by applying your downsampling function one, two and three times respectively. Show all four images in the same MATLAB figure. Is the textured content in f accurately represented in its downsampled versions? Why or why not? (You can add comments to your `.m` file using `%`.)

3. Similar to Project 1, define two different 128 by 128 images by

`I1 = sin(2*pi*v11*x')*sin(2*pi*v12*x) + 1;`

`I2 = sin(2*pi*v21*x')*sin(2*pi*v22*x) + 1;` where `x = 0:1/128:1-1/128`;

and such that `downsample2(I1) = downsample2(I2)` using the downsampling function you wrote for Question 2. Choose $v11$, $v12$, $v21$ and $v22$ to be distinct from one another. Show $I1$, $I2$ and their downsampled versions all in the same figure.