Name: _____

EE 193-03 Homework 2

Due via `provide` at 11:59pm, 4 October 2018

Submission

Zip up your code (i.e., the "code" subdirectory of the starter code package) and submit it via provide from one of the Linux machines:

```
provide ee193HIP hw2 <ZIP FILE>
```

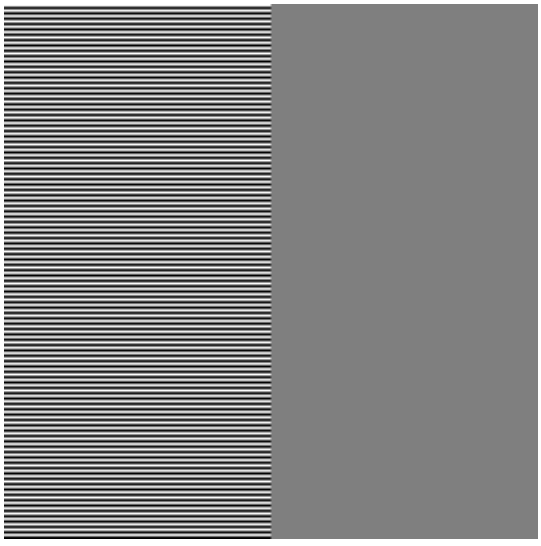
Please don't submit the data files. They're big, and I have those already.

Problem 1: Experimenting with gamma

Normally it's difficult to observe the gamma mapping that your computer screen is doing, because it all happens "magically" behind the scenes, and you don't have an easy way to measure the true light output of the screen.

However, if you create alternating rows of pixels with different gray levels and step back from your screen, the lines blur together to produce a gray which is the average luminance of the two. We can compare this to a solid gray, and find the value with matching luminance.

Write a MATLAB script in that creates a 200x200 pixel image like the one below. The left half should be alternating rows of gray values, while the right should be solid with an intermediate value.



Then use your script to find the sRGB gray value that matches the luminance of the average of 0 and 255 (#000000 and #FFFFFF). *Hint: it's not 127.*

Problem 2: Cone responses

Given a multispectral image of a scene and an illuminant, compute the cone responses across the image. The file `coneresponse.m` contains the starter code for the problem, loading the multispectral image, the illuminant spectra, and the cone responses.

Compute the image of cone responses under D65 illumination and display it with a gamma of 2.4. The colors won't look right, since we're displaying the cone responses in the RGB channels, not properly converted RGB values (we'll do that in the next HW). However, the colors should roughly match those shown on the Metacow

page (`https://www.rit.edu/science/pocs/metacow`). For example, the yellow cow should at least look yellow-ish, and the blue cow should be blue-ish.

Repeat this using the `light_fluorescent` illumination. The (lack of) metamerism should be obvious.

Problem 3: Meta-meta-cow

Construct an illumination spectrum which causes two or more cows to be metameric with each other. Plot your spectrum, and show the resulting image.

Problem 4: Color matching

Suppose you have a display with three primaries, with spectra given in the variable `display_primaries`.

For each of the four cone response sets (stored as column vectors in `tristimulus`), find the intensity for the display primaries that would produce that response, or indicate that it is not possible (i.e., out of gamut). You should put your answers in a comment at the top of `colormatching.m`.

Again, we can do this more properly (and with meaningful units) using the XYZ color space, but that's for later.