First, if you haven't already, bookmark the class web page: http://astr2600s13.github.com/.

Second, you will be `git pull`ing the latest version of `ASTR2600_materials` as part of this tutorial. Note that this means you have copies of all the lectures in your cosmos folders! Use 'em if you need 'em!

Tutorial: Plotting and Colors

We're going to try to understand a little more about IDL's colors. In the process, we're going to do quite a bit of program editing work.

In order to cut down a bit on typing interactively at the command prompt, I'm providing you with some functioning code.

Get the code from git

Change directories to your `ASTR2600_materials` directory and `git pull`. You should new files in the `examples/` directory: `color_ref.pro` and `eyeball.pro`. Copy these into your `tutorials` directory.

Use the new code

Open `color_ref.pro` in `gvim` and keep it open.

Open IDL. At the IDL prompt, run `color_ref.pro` as a *procedure*.
`.r color_ref.pro`

You have a color table! But... what does it mean? Looking at `color_ref.pro` probably doesn't tell you much. There are no axis labels! There are no comments! OH NO!

Your job is to correct this!

ASSIGNMENT: Correct `color_ref.pro` to be more useful. Make sure it is well-commented. Commit your changes.

REMINDER: `i` gets you into insert mode. `a` does exactly the same thing, except AFTER the current character instead of BEFORE it. You can use `o` to add a new line AFTER the current line or `O` to add a new line above the current line. In the default color scheme, comments will show up as blue.

Playing with Plots and Colors

Next, run the `eyeball.pro` script (note that this is a script, not a program, so you have to `@` it instead of `.r`'ing it). Also open it in a text editor.

Add comments to `eyeball.pro` explaining what the unexplained lines (which we identified in class) do.

If there's anything you dislike about the so-called eyes, see if you can fix them. Possible fixes:

1. Convince IDL to draw within the lines
2. Make the eyes elliptical
3. Add some other features frequently seen in eyes (e.g. whites)

Finally, add a mouth! This can probably be done with a parabola. You will also probably need to change the plot limits.

Do this all within your personal `eyeball.pro`. Again, save and commit your changes, and when you're done, push your changes and create a pull request.

Reminder: a parabola is an even power of x, e.g. x^2.

ASSIGNMENT: Comment, fix up (as much as you'd like, but at least a little), and add a mouth to `eyeball.pro`.

Some simple python things you really want to know

Go to `http://matplotlib.org/examples/pylab_examples/show_colormaps.html` and download the source code `show_colormaps.py` into your `tutorials` directory.

Start up `ipython --pylab` (no notebook this time; we want the interactive version). Run the example code: `%run show_colormaps.py`

Now experiment with those colormaps. Pick 10 colormaps, and do the `imshow` command for each of them (you don't need to re-do the prep stuff though):

```
xx,yy = np.meshgrid(np.linspace(-5,5,100),np.linspace(-5,5,100))
# this is a gaussian:
gg = np.exp(-(xx**2+yy**2+xx*yy)/2.)
# the second * below is a special parameter that basically means
# "treat (a,b,c) as if it were a,b,c"
zz = gg*10 + np.random.randn(*gg.shape)
# end prep stuff

imshow(zz, cmap=cm.bone)
imshow(zz, cmap=cm.binary)
# etc...
```

Pick two of these to save. Save using `savefig`, e.g.:

```
savefig('tutorial9_binary.png')
```