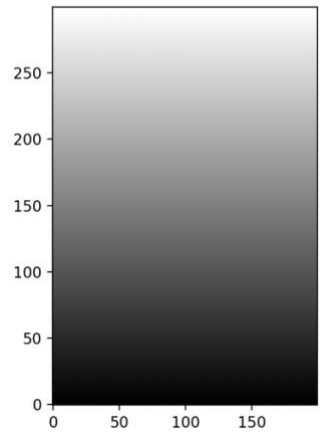
UCF Physics: AST 5765/4762: (Advanced) Astronomical Data Analysis Survey
Practicum 1: Python practice
09/05/2025

Welcome to your first practicum exercises!

We will start by doing 3 exercises that you have to hand-in.

1. (**10 points**) Start by coding this yourself. Don't use AI yet.

    - Make a 300×200 Float64 array. Each array element should contain its own y coordinate, starting with y = 0 for row 0 and ending with y = 299 for row 299 (i.e., row 0 has 200 .
    - How do you do that with a loop?
    - How do you do that without any loops?
    - Display the array using the matplotlib function for showing the image with a cmap of 'gray'.
    - Examine several randomly placed array elements with Python to be sure the values match the y coordinate in the print statements. Be careful that the final array has the correct data type.
    - Make sure that the lower left corner of your plot is 0,0! Your image should look like this:



Take a screen shot showing both your Python code and plot windows.

2. (**10 points**) Now repeat the above using the help of AI. How do you need to write your prompts to get the wanted outcome? Take a screenshot of your prompt(s) and the AI generated code and possible plots.

3. (**5 points**) If you haven't done it yet, install astropy https://docs.astropy.org/en/stable/install.html

   Download and read FITS file m42_40min_ir.zip from the `practicum/` folder. Don't worry, the fits function knows how to read the zip file and you don't need to unzip it in any way (see also: https://docs.astropy.org/en/stable/io/fits/). This file comes from the NOIRLab FITS liberator project. Plot it using the appropriate matplotlib function using a gray scale colormap. Make sure that the lower left corner of your plot is 0,0! What object is it?

   - Annotate the image by placing the object's name and your name as a title. Make sure the title fits within the image boundaries!
   - Add appropriate axis labels.
   - Use the appropriate python command to save the final plot in a PNG format. Remember to use an appropriate name following the class's conventions.