Name:_____

Astronomical wavelength calibration

1. For this lab, we're going to work through some web tutorials, and then apply them to data that was taken here at UA.
   Open these three websites:
   https://colab.research.google.com/github/skgrunblatt/astropy-tutorials/blob/main/tutorials/SpectroscopicDataReductionBasics/1_SpectroscopicTraceTutorial.ipynb
   https://colab.research.google.com/github/skgrunblatt/astropy-tutorials/blob/main/tutorials/SpectroscopicDataReductionBasics/2_WavelengthCalibration.ipynb
   https://colab.research.google.com/github/skgrunblatt/astropy-tutorials/blob/main/tutorials/SpectroscopicDataReductionBasics/3_Trace_Extract_Wavelength_CalibrateSpectrum.ipynb

2. (10 pts.) Run each one of these three tutorials, in order. Save the following plots: the plot of the "average_spectrum," "trace-weighted average" and "Gaussian model trace weighted average" the target star in Tutorial 1, a wavelength-corrected plot of the spectrum of Neon (wavelengths should be shown in nm on the x-axis) from Tutorial 2, and a continuum with a spectral line fit to it (a plot of the spectrum and a "fitted absorption model") and a "line-free continuum model" from Tutorial 3. Save these figures to your computer, either as screenshots or by saving them as files and then downloading them from the Google Colab.
3. (40 pts.) Now, repeat this the first tutorial, except using the spectra available on this webpage folder for this week:
   https://github.com/skgrunblatt/astropy-tutorials/tree/main/tutorials/SpectroscopicDataReductionBasics. Use the NGC7027 spectrum for wavelength calibration and either Betelgeuse or Sirius as your science target.

   Then, run these modified versions of the part 2 and part 3 tutorials:
   https://colab.research.google.com/github/skgrunblatt/astropy-tutorials/blob/main/tutorials/SpectroscopicDataReductionBasics/Lab7_part2_WavelengthCalibration.ipynb
   https://colab.research.google.com/github/skgrunblatt/astropy-tutorials/blob/main/tutorials/SpectroscopicDataReductionBasics/Lab7_part2_3_Trace_Extract_Wavelength_CalibrateSpectrum.ipynb
   Save images of your direct and trace-weighted average spectra (last plot from Part 1), your wavelength-corrected spectrum of NGC 7027 and your

linear wavelength correction (the last 2 plots from Part 2), and wavelength-corrected spectrum of either Betelgeuse or Sirius (last plot in Part 3).

You may find these webpages helpful:
http://wsdiscovery.free.fr/astronomie/spectro/atlas/np/ngc7027/index.html
http://astronomy.nmsu.edu/drewski/tableofemissionlines.html

To get full credit: Either print out images of all of the figures requested, or send all saved figures to me via email in a self-contained, zipped folder labeled 'lastname_AY203_week7.zip'.