WARNING! This homework is math intensive. Though there are very few numbers, there will be algebra. If you are having trouble, please come to me for help! Don't wait till the last minute.

1 Star Carlos has twice the radius as star Rebecca but half the temperature. Which star is more luminous? Which star is bluer? If star Rebecca is twice as far away as star Carlos which one will appear brighter (have greatest flux)? SHOW YOUR WORK!

2 Why do RGB and AGB(double shell burning) phases of a star's life move away from the main sequence location of the HR diagram to become cooler (redder) and brighter? Why does the HGB phase move towards the main sequence location? What is going on in the stars interior?

3. Why does a massive star go supernova? Why won't our own star ever do this? Why are supernovas important to us? (Hint what do they provide the universe?) Would you exist without massive stars dying? Why or why not? Why do massive stars have so much shorter lives than low mass stars?

4 What are the differences between a white dwarf star and a neutron star in mass, radius, density and progenitor? Which type of degeneracy supports each? Explain how the De Broglie wavelength explains the differences between these two stars.

5. What would happen to the Earth if the Sun became a black hole? Why? The black hole in the center of our galaxy is about 1 million solar masses and about 2 billion AU away. The force of gravity is:

\[ F = \frac{GM_M_{\text{Earth}}}{R^2} \]

where r is distance. Before you plug in any numbers, find the ratio of the gravitational force of the black hole in the center of our galaxy to the gravitational force of the Sun. Your G and one of the Ms ( the one that would represent the mass of the Earth). Show (show your work!) that this ratio is:

\[ \frac{F_{BH}}{F_{\text{Sun}}} = \frac{M_{BH}}{M_{\text{Sun}}} \frac{\text{Distance}_{BH}^2}{\text{Distance}_{\text{Sun}}^2} \]

Now plug in numbers ( you shouldn't have to actually plug in the mass of the Sun or the distance to the Sun since you know the BH mass and distance in sun units. What is the value of this ratio? Will tidal effects from the black hole in the center of our galaxy destroy the Earth in 2012? Why or why not?