Astronomy 210 – Midterm 2 Exam
Part 2 – Long Answer

Please answer the 3 following, multi-part questions as completely as you can. Each section is worth a total of 10 marks. When finished scan and e-mail the results to me before Friday, April 3 - 5:00 pm. Send to bemart1@gmail.com

Section 1 – Questions concerning the Sun

1. How do we know that the mass of the sun is 1.99×10^{30} kg? Support your explanation with an appropriate calculation. (2 marks)
2. The solar constant measured at the top of Earth's atmosphere is 1366 W/m^2. Use this to determine what the flux is at the surface of the sun. A simple sketch would help and be sure to explain your steps. No marks will be given for an un-supported numerical answer! (3 marks)
3. Use the result from question 2 to estimate the surface temperature of the sun. Again – show your work! (3 marks).
4. Use the results of questions 2 and 3 to estimate the total power output of the sun (2 marks).

Section 2 – Questions about Stars – Parallax, Distance Modulus etc

1. The star Betelgeuse currently has an apparent magnitude of 0.5 and is 700 light years away. Someday it will "go supernova" and shine with an absolute magnitude of -18. How bright will it appear at that time? (3 marks)
2. Explain what is meant by the term "spectroscopic parallax" (2 marks)
3. The star HD 145389 (in the constellation Hercules) is an A0V star with an apparent magnitude of 4.2. Use the method of spectroscopic parallax to estimate the distance of this star. (3 marks)
4. What is the parallax of HD 145389? (2 marks)

Section 3 – Questions about Stars – Mass, Size, Temperature etc…

1. When our sun nears the end of its life it will cool to about 3100K and expand to about 180 times its current radius – would you expect the sun to be brighter or dimmer at this point? How many times more or less luminous will it be at this stage? (3 marks).
2. What would the "colour" of the sun be at this point? Support your claim with an appropriate calculation. (2 marks)
3. Estimate the solar constant at this point – that is – how much energy will earth receive per square meter/s from the dying sun? (2 marks)
4. Without our atmosphere (and the benefit of greenhouse gases) the average temperature on Earth would be about 250 K. By the time our sun reaches this age Earth will have no atmosphere. Estimate the surface temperature of the earth at this time. (3 marks). Be sure to explain your reasoning here!