

AST 301

Homework #6

Due Friday March 11

1. Look up the diameter of the Sun and the size of the Astronomical Unit (AU) in your book. When the Sun becomes a red giant, in about 5 billion years, its diameter will increase to about 1 AU.

a) By what factor will the diameter of the Sun change?

(How many times larger will it be?)

b) By what factor will the radius of the Sun change?

c) By what factor will the surface area of the Sun change?

d) If the temperature of the Sun didn't change while becoming a red giant, it would become more luminous simply because it would have a larger surface to radiate light. If the temperature of the Sun didn't change while its diameter increased to 1 AU, by what factor would its luminosity change?

e) In fact, the surface of the Sun will cool from about 6000 K to about 3000 K when it becomes a red giant. By what factor will the power radiated by each square meter of its surface change? (We haven't talked about this formula in class. You will have to find it in the book.)

f) Now, combine your answers to parts e and f to calculate what the luminosity of the Sun will be when it becomes a red giant.

Note: The description of your observations of the Moon are also due on Friday.

(Because it has been rather cloudy for the last month I don't expect more than a few observations.)