AST 337 Name_____
Spring 2009

Exercise 5: Error Propagation
Due Tuesday, March 31

The radii of most stars are too small to be resolved with direct images. The usual method for "measuring" stellar radii is to derive them from the Stefan-Boltmann relation for thermal emission,

$$L = 4\,\pi R^2 \sigma_{SB} T^4$$

…since L and T are easier to measure directly than R.

Given:

Property	**Value**
T_{eff} for Star 337	5000 ± 100 K
L for Star 337	$4.0 \pm 0.1 \times 10^{33}$ ergs
σ_{SB}	5.6×10^{-5} erg cm^{-2} K^{-4} s^{-1}
1 R_{sun}	6.960×10^{10} cm

Find and report:

1. the radius R for Star 337, in both cm and solar units;
2. the error σ_R for the radius of Star 337, in both cm and solar units; and
3. the percentage error of the radius of Star 337. Also,
4. indicate which term dominates the uncertainty.

Be sure to show:
- The applicable formulae for error propagation
- The derivation for the functional form of σ_R
- The values (and units) of all key steps in the derivation