AST 300B – Spring 2019
<u>In-class Problem Due: Monday January 14</u>

1. Assume that the Sun radiates isotropically. Let R be the radius of the Sun, let F be the flux emerging from the surface of the Sun, and let f be the flux observed at a distance r away from the Sun.

(a) Derive an expression for how f depends on r? (Hint: consider the Luminosity and assume no energy is lost between the surface of the Sun and a sphere with a radius of r.)

(b) From a distance of $r >> R$, what solid angle, Ω, does the Sun subtend?

(c) Define the average surface brightness, B, of the Sun as the observed flux at a distance r divided by the observed solid angle of the Sun from a distance r ($B = f/\Omega$). What famous photometric quantity is the surface brightness equal to (prove your answer)?

(d) How does the surface brightness of the Sun depend on r? This result is fundamental to why we use this photometric quantity.