

**AST 300B – Spring 2018**  
**In-class Problem Due: Friday January 19**

2. 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  $r \gg R$ , what solid angle,  $\Omega$ , 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.

