

# AST 714 Midterm Exam

March 1, 2019

Good luck. Due March 27th. You may use as a reference book or other materials, but should work individually on the problems.

1. Do problem 4.3 Rybicki and Lightman.
2. An object has a measured emission at 100 MHz of  $F = 5 \times 10^{-17} \text{ erg cm}^{-2} \text{ s}^{-1} \text{ Hz}^{-1}$  at a telescope with a resolution of 9 arc minutes.
  - (a) Assuming it is unresolved and radiating as a blackbody, what can you say about the temperature of the object?
  - (b) Assuming it is just resolved and radiating as a blackbody and is as large as can be and not be resolved what can you say about the temperature?
  - (c) What can you say about the temperature of the material doing the emission?
3. Find the magnetic field from an infinitely long straight current by transforming the electric field from an infinitely long straight line charge.
4. Consider the ejecta of a supernova, if we approximate this as a sphere of radius,  $R$ , of 10 solar mass of fully ionized hydrogen at temperature  $T=10^6$  K, then:
  - (a) What would be the emission from this sphere if we treated it as a black body?
  - (b) What would be the emission from this sphere if we treated it as optically thin Bremsstrahlung?
  - (c) At what radius are they equal?