Astronomy 103
Final Exam
May 12, 2014

Instructions:

No books, notes or calculator are allowed. You have 2 hours to complete the exam, and please do not turn to the next page until instructed to do so.

You may find the following information helpful:

- 1 AU $= 3 \times 10^8$ km
- speed of light $= 3 \times 10^8$ m/s
- Kepler's 3rd law:
$$a^3 = P^2$$
with the period P in years and semi-major axis a in AU.
- Newton's law of gravity:
$$F = \frac{GMm}{r^2}$$
- Peak wavelength and temperature of blackbody radiation:
$$\lambda = \frac{3 \times 10^6}{T} \text{ nm}$$
with wavelength λ in nm (1 nm = 10^{-9} m) and temperature T in Kelvin.
- Conversion of mass into energy: $E = mc^2$
- Relationship between brightness B and distance d:
$$B_2 = B_1 \times \frac{d_1^2}{d_2^2}$$
- Relationship between luminosity L, temperature T and radius R of stars:
$$L = 4\pi\sigma T^4 R^2$$
where $4\pi\sigma$ are constants.
- Hubble's law:
$$v = H \times d$$
where v is velocity in km/s, d is distance in Mpc, and H is the Hubble constant, $H = 70$ km/s/Mpc.