

**Astronomy 103**  
**Midterm 2**  
**March 26, 2014**

**Instructions:**

**No books, notes or calculator are allowed.** You have 50 minutes 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  $\lambda$  in nm ( $1 \text{ nm} = 10^{-9} \text{ m}$ ) 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.

