

## Astronomy 160b, 2007 — information for final exam

Time: 9am, May 12, 2007

Place: Dunham Lab 220

1. The test will cover the *third section* of the course (cosmology).
2. As usual the test is **open book**. You may consult any notes or readings you wish. However **no electronic devices, including laptops and calculators** are allowed. Note that some potentially useful values of logarithms will be written on the test (see below).
3. The final will last 2.5 hours, and there will be a total of 60 points, at least half of which will involve calculations of some kind.
4. For your convenience, the following information will be printed on the test:

$$1 \text{ year} = 3 \times 10^7 \text{ seconds}$$

$$1 \text{ A.U.} = 1.5 \times 10^{11} \text{ m}$$

$$1 M_{\odot} = 2 \times 10^{30} \text{ kg}$$

$$1 M_J = 10^{-3} M_{\odot}$$

$$1 M_E = 3 \times 10^{-6} M_{\odot}$$

$$c = 3 \times 10^8 \text{ m/s}$$

$$G = 7 \times 10^{-11} \text{ in mks units}$$

$$1 \text{ parsec} = 3 \times 10^{16} \text{ m}$$

$$1 \text{ radian} = 2 \times 10^5 \text{ arcseconds}$$

$$a^3 = P^2 GM / (4\pi^2)$$

$$\alpha = D_2 / D_1$$

$$V = 2\pi a / P$$

$$V^2 = GM/a$$

$$z = \Delta\lambda/\lambda = \Delta P/P = [(1 + v/c)/(1 - v/c)]^{1/2} - 1 \approx v/c$$

$$V = HD$$

$$\Omega_M = \rho/\rho_{\text{crit}}; \rho = M/\text{volume}; \rho_{\text{crit}} = 3H^2/(8\pi G)$$

$$m_1 - m_2 = -2.5 \log(b_1/b_2)$$

$$m - M = 5 \log(D/10\text{pc})$$

$$\log(2) = 0.3; \log(3) = 0.5; \log(5) = 0.7; \log(7) = 0.85$$

$$\log(a \times b) = \log(a) + \log(b)$$

$$\log(a/b) = \log(a) - \log(b)$$

5. You should probably have some inkling of how the following concepts and terms relate to the course:

- absolute and apparent magnitude
- Dark Matter, WIMPs and MACHOs
- the critical density
- Hubble's Law and the Hubble Diagram
- standard candles and the distance ladder
- Type Ia supernovae, including how SNAP and LSST hope to improve our understanding
- Dark Energy and the cosmological constant ( $\Lambda$ )
- collapsing and expanding universes; the “concordance” cosmology and the Big Rip
- scale factor of the Universe (and associated diagrams)
- constraints imposed by the cosmic microwave background and large scale structure of the Universe