Astronomy 160b, 2007 — information for test on March 27, 2007

1. The test will have essentially the same format as the last one. It will be **open book** but **no electronic devices, including laptops and calculators** will be allowed. In the test, an astronomical situation will be presented, and you'll be asked to discuss some relevant issues and carry out some calculations. Between 1/2 and 2/3 of the test will be calculations.

2. The test will cover the relativity/blackhole part of the course. Nothing on planets (except that many of the same equations and concepts apply to both).

3. The calculations will be based on the equations and quantities given below (which will be reproduced on the test paper). For the non-calculation part of the test, I've given a list of terms that have been mentioned during this part of the course.

4. This portion of the course came out quite differently from previous years, so I haven't included a previous test. I'd advise making sure you understand the solutions to the problem sets, and the concepts discussed in lecture and sections. The black hole website may also provide some useful information, although there are large sections of it that were not covered in class, and thus will not be on the test.

5. Sections on Monday March 26 will be devoted entirely to review for the test. There will also be a review session at 9:15pm that night (place TBD) so please bring your questions!

$1 \text{ year} = 3 \times 10^7 \text{ seconds}$ $\qquad$ $1 \text{ A.U.} = 1.5 \times 10^{11}\text{m}$

$1M_\odot = 2 \times 10^{30} \text{ kg}$ $\qquad$ $1M_J = 10^{-3}M_\odot$ $\qquad$ $1M_E = 3 \times 10^{-6}M_\odot$

$P_J \approx 11 \text{ years}$ $\qquad$ $a_J \approx 5 \text{ A.U.}$

$c = 3 \times 10^8 \text{ m/s}$ $\qquad$ $G = 7 \times 10^{-11} \text{ in mks units}$

$1 \text{ parsec} = 3 \times 10^{16}\text{m}$ $\qquad$ $1 \text{ radian} = 2 \times 10^5 \text{ arcseconds}$

$a^3 = P^2 GM/(4\pi^2)$ $\qquad$ $\alpha = D_2/D_1$

$V = 2\pi a/P$ $\qquad$ $V_* M_* = V_p M_p$

$z = \Delta P_p/P_p = \Delta\lambda/\lambda_0 = \left\{\frac{1+V_R/c}{1-V_R/c}\right\}^{1/2} - 1 \approx V_r/c$ $\qquad$ $(1+\epsilon)^n \approx 1 + n\epsilon$

$V_{esc} = (2GM/R)^{1/2}$ $\qquad$ $R_s = 2GM/c^2$

$v_{tot} = (v_1 + v_2)/(1 + v_1 v_2/c^2)$ $\qquad$ $z_{\text{grav}} = \frac{1}{\sqrt{1 - R_s/R}} - 1$

Terms, concepts and phenomena studied during this section of the course include the following: the escape velocity; event horizons and the Schwarzshild radius; special and general relativity; curved space-time vs. Newtonian gravitational force; Newtonian, post-Newtonian and strong field relativistic effects; precession of the periastron; deflection of light; gravitational redshift; gravitational wave radiation and period decrease; pulsars and binary pulsars; X-ray binaries and "dynamically confirmed black hole candidates".