Astrophysics (Astr 3415)
Spring 2009
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HOMEWORK #5

1. Problem 10.1 of the text.
2. Problem 10.20 of the text. (Only do parts a and b.)
3. Problem 10.23 of the text.
4. Problem 12.1 of the text.
5. Problem 12.15 of the text.
6. The interior structure of some objects can be approximately described by polytropes. Jupiter can be roughly modeled by a polytrope of $n = 1$. Given the mass M and radius R of Jupiter, derive an expression for the central density ρ_c. Recall that for $n = 1$, one has that $D_1 = \sin\xi/\xi$, $r = \lambda_1\xi$, and $\xi_1 = \pi$.

   Hint: First express the constant K in terms of R, then relate ρ_c to the mass using

   $$M = 4\pi\,\rho_c \int_0^R D_1(\xi)\, r^2\, dr.$$

   Then insert values for M and R to find ρ_c.