NAME: _____

Astronomy 210 **Spring 2011**

HOUR EXAM 1

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1. DO NOT OPEN THIS EXAM UNTIL INSTRUCTED TO DO SO.
2. Write your answers in the blue book provided to you.
3. Show all of your work, and indicate clearly your final answer! A correct final answer may not receive credit if no work is shown.
4. When numerical answers are required, first solve the problem algebraically and then plug in numbers at the last step. This avoids errors and makes your thinking clearer to yourself and to the grader.
5. Budget your time! Don't get stalled on any one question.
6. The total possible score is 100 points.
7. For your reference there are formulas below.

Possibly Useful Formulae

Astronomical Unit: $1\,\mathrm{AU} = 1.5 \times 10^{11}\,\mathrm{m}$.
gravitational constant : $G = 6.7 \times 10^{-11}\ \mathrm{m^3\,kg^{-1}\,s^{-2}}$
$M_\odot = 2.0 \times 10^{30}\ \mathrm{kg}$ $M_{\mathrm{Earth}} = 6.0 \times 10^{24}\ \mathrm{kg}$ $M_{\mathrm{Jupiter}} = 1.9 \times 10^{27}\ \mathrm{kg}$
$R_{\mathrm{Earth}} = 6400\ \mathrm{km}$

$1/P_{\mathrm{inf}} = 1/E + 1/S$	$1/P_{\mathrm{sup}} = 1/E - 1/S$	
$\vec{v} = d\vec{r}/dt$	$\vec{p} = m\vec{v}$	$\vec{F} = m\vec{a}$
$\omega = d\theta/dt$	$\omega = 2\pi/P$	$v_\theta = \omega r$
$\vec{L} = \vec{r} \times \vec{p} = m\vec{r} \times \vec{v}$	$v_{\mathrm{circ}} = 2\pi r/P$	$a_{\mathrm{c}} = v^2/r = \omega^2 r$
$\vec{F} = Gm_1m_2/r^2\ \hat{r}$	$F = Gm_1m_2/r^2$	$g = GM/r^2$
$r = (1-e^2)a/(1+e\cos\theta)$	$r_{\mathrm{ap}} = (1+e)a$	$r_{\mathrm{peri}} = (1-e)a$
$a^3_{\mathrm{AU}} = P^2_{\mathrm{yr}}$	$a^3 = GMP^2/4\pi^2$	
$v^2 = GM(2/r - 1/a)$	$v^2_{\mathrm{circ}} = GM/r$	$v_{\mathrm{esc}} = \sqrt{2GM/r}$
$KE = 1/2\ mv^2$	$PE = -GMm/r$	$TE = KE + PE$

NOTE: the above symbols may have different meanings in different equations!