

ASTR117A - Equation Sheet for Exam#1

$$F_{grav} = \frac{GMm}{r^2} \quad (1)$$

$$F_{elec} = \frac{1}{4\pi\epsilon_0} \frac{q_1q_2}{r^2} \quad (2)$$

$$r = \frac{a(1 - e^2)}{1 + e \cos \theta} \quad (3)$$

$$\vec{L} = m\vec{r} \times \vec{v} = \vec{r} \times \vec{p} \quad (4)$$

$$\frac{dA}{dt} = \frac{|\vec{L}|}{2m} \quad (5)$$

$$v^2 = 2GM \left(\frac{1}{r} - \frac{1}{2a} \right) \quad (6)$$

$$P^2 = \frac{4\pi^2 a^3}{GM} \quad (7)$$

$$K = \frac{1}{2}mv^2 \quad (8)$$

$$U = -\frac{GMm}{r} \quad (9)$$

$$U_{\text{uniform sphere}} = -\frac{3}{5} \frac{GM^2}{R} \quad (10)$$

$$\text{Virial Theorem : } |U| = 2K \quad (11)$$

$$\frac{dP}{dr} = -\frac{G\rho(r)M_r}{r^2} \quad (12)$$

$$E = mc^2 \quad (13)$$

$$\tau = \frac{U}{L} \quad (14)$$