Equations to live by:

$$m_1 - m_2 = -2.5 \log(f_1/f_2)$$

$$m_1 = -2.5 \log(f_1) + C$$

$$m - M = 5 \log d - 5 + A, \text{d is in pc}$$

$$v = H_0 \text{ d}$$

$$\left(\frac{\dot{R}}{R}\right)^2 - \frac{8}{3}\pi G\rho - \frac{1}{3}\Lambda = -\frac{k}{R^2}$$

$$\Omega = \frac{\rho}{\rho_{crit}}$$

$$\rho_{crit} = \frac{3H^2}{8\pi G}$$

$$R^3(t)\rho(t) = R_0^3\rho_0 = \rho_0$$

$$H(t) = \frac{\dot{R}}{R}$$

$$(1+z) = \frac{1}{R}$$

$$F = \frac{L}{4\pi d_L^2}$$

$$d_L = (1+z)\ d_p$$

$$d_L \simeq \frac{cz}{H_0}[1 + \frac{1}{2}(1 - \frac{\Omega_0}{2})z]$$

$$d_A = (1+z)^{-1} d_p$$

$$\theta = \frac{r}{d_A}$$

$$E(B-V) = (B-V) - (B-V)_0$$

$$R_V = \frac{A_V}{E(B-V)} \text{ Assume } R_V = 3.1.$$

$$1 \text{ pc} = 3.086 \times 10^{18} \text{ cm}$$

$$\text{c} = 2.998 \times 10^{10} \text{ cm/s}$$

$$1 \text{ pc} = 206265 \text{ AU}$$

$$1 \text{ arcsec} = 1/60 \text{ arcmin} = 1/206265 \text{ radians}$$

$$1 \text{ arcmin} = 1/60 \text{ degree}$$

$$W = 2\ v_{max}\ \sin(i)$$

$$KE = \frac{1}{2}mv^2$$

$$PE = -GMm/r$$

$$\text{Virial Theorem : 2KE} = -\text{PE}$$

$$1\ \mathcal{M}\odot = 1.99 \times 10^{33}\text{gm}$$

$$G = 6.672 \times 10^{-8}\text{cm}^3\text{gm}^{-1}\text{sec}^{-2}$$

$$\sin\ \theta = r/d \sim \theta$$

$$I(r) = \frac{L}{4\pi D^2}$$