Astronomy 25
Useful Equations
First half of semester

$L^2=\Delta x^2 + \Delta y^2 + \Delta z^2$
(The spatial distance (L) between two points, separated by Δx, Δy, and Δz)

$v= \Delta x/\Delta t$
(Linear velocity)

$v=v_1 + v_2$
(Newtonian velocity addition)

$a=\Delta v/\Delta t$
(Linear acceleration)

$\Delta x=\frac{1}{2}a\Delta t^2$
(displacement from an acceleration)

$R=(v^2/g)\sin 2\theta$
(Range of a missile)

$F=ma$
(Newton's Second Law)

$F=GM_1M_2/R^2$
(Newton's Law of Gravity)

$E=\frac{1}{2}mv^2$
(Kinetic energy)

$E=mgh$
(Potential energy in a uniform gravitational field)

$E=GMm/R$
(Energy gained by falling towards a massive object)

$F=mv^2/R$
(Force needed to keep an object in a circular path.)

$c=\lambda\nu$
(speed of light, wavelength, frequency)

$\lambda_{max}=2900000/T$
(Wien's Law)

$E=4\pi R^2\sigma T^4$
(Stefan-Boltzmann law)

$\frac{(\lambda - \lambda_o)}{\lambda_o} = \frac{\Delta\lambda}{\lambda_o} = \frac{v_r}{c}$
(Doppler Effect)

$P=\rho kT$
(Thermal Pressure)

$D=\frac{3.26\ LY}{p} = \frac{1\ pc}{p}$
(Distance from trigonometric parallax)

$V=Hd$
(Hubble's Law)

$\beta = v/c$
(Simple relativistic parameter)

$\gamma =1/\sqrt{(1-v^2/c^2)}$
(Lorentz factor)

$\Delta t= \gamma\Delta t'$
(Time dilation)

$L= L_o/\gamma$
(Lorentz contraction)

$E=mc^2$
(mass-energy equivalence)

$V= \frac{(v_1+v_2)}{(1+v_1v_2/c^2)}$
(Relativistic velocity addition)