1st Midterm Formula

$$\vee_{av} = \frac{l}{t} \qquad l = \vee_{con} t \qquad v = \lim_{\Delta t \to 0}\left[\frac{\Delta l}{\Delta t}\right] \equiv \frac{dl}{dt}$$

$$\vec{v}_{av} = \frac{\vec{s}}{t} \qquad \vec{v} = \frac{d\vec{s}}{dt} \qquad \mathrm{A_y} = \left|\vec{A}\right|\sin\theta \qquad \mathrm{A_x} = \left|\vec{A}\right|\cos\theta$$

$$C_x = A_x + B_x \qquad C_y = A_y + B_y \qquad C = \sqrt{C_x^2 + C_y^2} \qquad \theta = \tan^{-1}\frac{\left|C_y\right|}{\left|C_x\right|}$$

$$\vec{A} = A_x\hat{i} + A_y\hat{j} + A_z\hat{k} \qquad \vec{r} = x\hat{i} + y\hat{j} + z\hat{k} \qquad \vec{v} = \frac{d\vec{r}}{dt} = \frac{dx}{dt}\hat{i} + \frac{dy}{dt}\hat{j} + \frac{dz}{dt}\hat{k}$$

$$\vec{v}_{TE} = \vec{v}_{TR} + \vec{v}_{RE}$$

$$\vec{a}_{av} = \frac{\Delta\vec{v}}{\Delta t} = \frac{\vec{v}_{\mathrm{f}} - \vec{v}_{\mathrm{i}}}{\mathrm{t_f} - t_i} \qquad a_{av} = \frac{\Delta v}{\Delta t} = \frac{v_{\mathrm{f}} - v_{\mathrm{i}}}{\mathrm{t_f} - t_i} \qquad \vec{a} = \lim_{\Delta t \to 0}\left[\frac{\Delta\vec{v}}{\Delta t}\right] = \frac{d\vec{v}}{dt}$$

$$v = v_0 + at \qquad v_{av} = \frac{1}{2}(v_0 + v) \qquad s = v_{av}t = \frac{1}{2}(v_0 + v)t \qquad s = v_0 t + \frac{1}{2}at^2$$

$$v^2 = v_0^2 + 2as \qquad v = v_0 + a_t t \qquad l = v_0 t + \frac{1}{2}a_t t^2 \qquad v^2 = v_0^2 + 2a_t l$$

$$v_{av} = \frac{1}{2}(v_0 + v) \qquad s(t) = s_0 + \int_0^t v(t)dt \qquad v(t) = v_0 + \int_0^t a(t)dt$$

$$\frac{v^2 - v_0^2}{2} = \int_{s_o}^{s} a(s)ds \qquad t - t_0 = \int_{s_o}^{s}\frac{ds}{v(s)}$$

$$\vec{F} = \frac{d\vec{p}}{dt} \qquad \sum\vec{F} = m\vec{a} \qquad \mathrm{F_{av}} = ma_{av} \qquad \vec{F}_w = m\vec{g} \qquad F_f(\max) = \mu_s F_N$$

$$F_f = \mu_k F_N \qquad F_f = \mu_r F_N \qquad \sum\vec{\mathrm{F}} = 0 \qquad \sum\mathrm{F_x} = 0 \text{ and } \sum\mathrm{F_y} = 0$$

$$a_c = \frac{v^2}{r} \qquad F_c = ma_c = \frac{mv^2}{r} \qquad \tan\theta = \frac{v^2}{gr} \qquad \mathrm{F_G} = G\frac{mM}{r^2} \qquad g_0 = \frac{GM_\oplus}{R_\oplus^2}$$

$$g_\oplus(r) = \frac{GM_\oplus}{r^2} \qquad \frac{r_{\mathrm{O}}^3}{T^2} = C_{\mathrm{O}} \qquad v_0 = \sqrt{\frac{GM}{r}} \qquad = \frac{\vec{\mathrm{F}}_{\mathrm{G}}}{\mathrm{m}}$$