Physics 2210 – Exam Two Formulae and Constants

$$\sin(\theta)=\frac{\text{opp}}{\text{hyp}} \qquad \cos(\theta)=\frac{\text{adj}}{\text{hyp}} \qquad \tan(\theta)=\frac{\text{opp}}{\text{adj}}$$

$$r=\sqrt{x^2+y^2+z^2}$$

$$\vec{A}\cdot\vec{B}=A_xB_x+A_yB_y+A_zB_z$$
$$\vec{A}\cdot\vec{B}=|\vec{A}||\vec{B}|\cos(\theta)$$

$$\vec{A}\times\vec{B}=-\vec{B}\times\vec{A}$$
$$|\vec{A}\times\vec{B}|=|\vec{A}||\vec{B}|\sin(\theta)$$

$$\vec{A}\times\vec{B}=\begin{vmatrix}\hat{i} & \hat{j} & \hat{k}\\ A_x & A_y & A_z\\ B_x & B_y & B_z\end{vmatrix}$$

$$\vec{r}=\vec{r}_0+\vec{v}_0t+\frac{1}{2}\vec{a}t^2$$
$$\vec{r}=\vec{r}_0+\frac{1}{2}\left(\vec{v}_0+\vec{v}\right)t$$
$$\vec{v}=\vec{v}_0+\vec{a}t$$
$$v^2=v_0^2+2\vec{a}\cdot\left(\vec{r}-\vec{r}_0\right)$$

$$\vec{v}=\frac{d\vec{r}}{dt} \qquad \vec{a}=\frac{d\vec{v}}{dt} \qquad \vec{a}=\frac{d^2\vec{r}}{dt^2}$$

$$\Delta\vec{r}=\vec{r}_f-\vec{r}_i$$
$$\vec{\bar{v}}=\frac{\Delta\vec{r}}{\Delta t}$$
$$\vec{\bar{a}}=\frac{\Delta\vec{v}}{\Delta t}$$

$$a_r=\frac{v_t^2}{r} \qquad T=\frac{2\pi r}{v_t}$$

$$As^2+Bs+C=0 \quad\rightarrow\quad s=\frac{-B\pm\sqrt{B^2-4AC}}{2A}$$

$$\sum\vec{F}=m\vec{a}$$

$$f_s\le\mu_sn$$
$$f_k=\mu_kn$$

$$W=\vec{F}\cdot\Delta\vec{s}=F_s\Delta s$$
$$W_{net}=\vec{F}_{net}\cdot\Delta\vec{s}=\Delta K$$
$$W_C=-\Delta U$$

$$F_{spring}=-kx$$

$$\vec{w}=m\vec{g}$$

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

$$K_i+U_i+\Delta K_{NC}=K_f+U_f$$
$$\Delta K+\Delta U=\Delta K_{NC}$$

$$U_{gravity}=mgy$$
$$U_{spring}=\frac{1}{2}kx^2$$

$$\vec{p}=m\vec{v}$$

$$\bar{P}=\frac{\Delta W}{\Delta t}$$
$$P=\frac{dW}{dt}=\vec{F}\cdot\vec{v}$$

$$\Delta K_{NC}=-f_k\Delta s$$

$$\vec{F}=\frac{d\vec{p}}{dt}$$

$$\vec{I}=\Delta\vec{p}=\vec{F}\,\Delta t$$

$$\vec{p}_{total}=\vec{p}_1+\vec{p}_2=\text{constant}$$
$$\Sigma\,\vec{p}_i=\Sigma\,\vec{p}_f$$

$$s=r\theta$$

$$\theta=\theta_0+\omega_0t+\frac{1}{2}\alpha t^2$$
$$\theta=\theta_0+\frac{1}{2}\left(\omega_0+\omega\right)t$$
$$\omega=\omega_0+\alpha t$$
$$\omega^2=\omega_0^2+2\alpha\left(\theta-\theta_0\right)$$

$$\Delta\theta=\theta_f-\theta_i$$
$$\bar{\omega}=\frac{\Delta\theta}{\Delta t}=\frac{\theta_f-\theta_i}{t_f-t_i}$$
$$\omega=\frac{d\theta}{dt}$$
$$\bar{\alpha}=\frac{\Delta\omega}{\Delta t}=\frac{\omega_f-\omega_i}{t_f-t_i}$$
$$\alpha=\frac{d\omega}{dt}=\frac{d^2\theta}{dt^2}$$

$$I=\sum_{i=1}^{n}m_ir_i^2$$

$$v_t=r\omega$$
$$a_t=r\alpha$$

$$\sum\tau=I\alpha$$

$$\vec{\tau}=\vec{r}\times\vec{F}$$
$$|\vec{\tau}|=|\vec{r}||\vec{F}|\sin(\theta)$$

$$K_R=\frac{1}{2}I\omega^2$$

$$K=\frac{1}{2}I\omega^2+\frac{1}{2}mv_{cm}^2$$

$$v_{cm}=R\omega$$
$$a_{cm}=R\alpha$$

$$P=\tau\omega$$

$$W_{net}=\tau_{net}\theta=\Delta K_R$$

$$L_i=L_f$$
$$I_i\omega_i=I_f\omega_f$$

$$\vec{\tau}=\frac{d\vec{L}}{dt}$$

$$\vec{L}=\vec{r}\times\vec{p}$$
$$|\vec{L}|=m|v||\vec{r}|\sin(\phi)$$
$$L=I\omega$$

Physical Constants

$$|\vec{g}|=9.80\ \text{m/s}^2$$