PHYS 1211 Fall 2019 Test 1
Equation Sheet

$$\Delta\vec{r} = \vec{r}_f - \vec{r}_i \qquad \vec{v}_{\text{avg}} = \frac{\Delta\vec{r}}{\Delta t} \qquad \vec{a}_{\text{avg}} = \frac{\Delta\vec{v}}{\Delta t} \qquad \vec{a}_y = -g\hat{j} \tag{1}$$

$$\Delta t = t_f - t_i \qquad \vec{v} = \frac{d\vec{r}}{dt} \qquad \vec{a} = \frac{d\vec{v}}{dt} \qquad \vec{v}_{\text{avg}} = \frac{1}{2}(\vec{v}_i + \vec{v}_f) \tag{2}$$

$$x_f = x_i + \frac{1}{2}(v_{xi} + v_{xf})(t_f - t_i) \qquad y_f = y_i + \frac{1}{2}(v_{yi} + v_{yf})(t_f - t_i) \tag{3}$$

$$x_f = x_i + v_{xi}(t_f - t_i) + \frac{1}{2}a_x(t_f - t_i)^2 \quad y_f = y_i + v_{yi}(t_f - t_i) + \frac{1}{2}a_y(t_f - t_i)^2 \tag{4}$$

$$v_{xf} = v_{xi} + a_x(t_f - t_i) \qquad v_{yf} = v_{yi} + a_y(t_f - t_i) \tag{5}$$

$$v_{xf}^2 = v_{xi}^2 + 2a_x(x_f - x_i) \qquad v_{yf}^2 = v_{yi}^2 + 2a_y(y_f - y_i) \tag{6}$$

$$\omega = 2\pi/T \qquad s = r\theta \qquad T = \frac{2\pi r}{v} \qquad a_r = \frac{v_t^2}{r} \tag{7}$$

$$\omega_{\text{avg}} = \frac{\Delta\theta}{\Delta t} \qquad \alpha_{\text{avg}} = \frac{\Delta\omega}{\Delta t} \qquad \omega = \frac{d\theta}{dt} \qquad \alpha = \frac{d\omega}{dt} \tag{8}$$

$$\theta_f = \theta_i + \frac{1}{2}(\omega_i + \omega_f)(t_f - t_i) \qquad \theta_f = \theta_i + \omega_i(t_f - t_i) + \frac{1}{2}\alpha(t_f - t_i)^2 \tag{9}$$

$$\omega_f = \omega_i + \alpha(t_f - t_i) \qquad \omega_f^2 = \omega_i^2 + 2\alpha(\theta_f - \theta_i) \tag{10}$$

$$v_t = r\omega \qquad a_t = r\alpha \tag{11}$$

Test 2 equations

$$\sum_j \vec{F}_j = m\vec{a} \qquad \vec{F}_{\text{g}} = -mg\hat{j} \tag{12}$$

$$f_s^{\max} = \mu_s N \qquad f_k = \mu_k N \qquad F_{\text{spring}} = -kx \tag{13}$$

$$|\vec{F}_{\text{grav}}| = G\frac{m_1 m_2}{r^2} \qquad v = \sqrt{\frac{GM}{r}} \qquad T = \frac{2\pi r^{3/2}}{\sqrt{GM}} \tag{14}$$

$$\vec{v}' = \vec{v} - \vec{v}_o \qquad \vec{r}' = \vec{r} - \vec{v}_o t \qquad K = \frac{1}{2}mv^2 \tag{15}$$

$$W = \vec{F} \cdot \vec{s} \qquad W = \Delta K \qquad W = \int \vec{F} \cdot d\vec{r} \tag{16}$$

$$P_{\text{avg}} = \frac{W}{\Delta t} = F\cos\phi v_{\text{avg}} = \vec{F}\cdot\vec{v} \quad P = \frac{dW}{dt} \tag{17}$$

Math relations and constants

$$\cos\theta = x/h \qquad \sin\theta = y/h \qquad \tan\theta = y/x \tag{18}$$

$$|\vec{r}| = \sqrt{x^2+y^2+z^2} \quad \rho = M/V \tag{19}$$

$$az^2 + bz + c = 0 \qquad z = \frac{-b}{2a} \pm \frac{\sqrt{b^2-4ac}}{2a} \tag{20}$$

$$\int t^n dt = t^{n+1}/(n+1) \quad (n \neq -1) \quad \text{Circumference} = 2\pi r \tag{21}$$

$$\vec{A}\cdot\vec{B} = AB\cos\phi = A_xB_x + A_yB_y + A_zB_z \tag{22}$$

$$A = \pi r^2 \quad V = \frac{4}{3}\pi r^3 \quad g = 9.8 \text{ m/s}^2 = 32.2 \text{ ft/s}^2 \tag{23}$$

$$c = 2.998\times10^8 \text{ m/s} \quad m_e = 9.109\times10^{-31} \text{ kg} \quad m_p = 6.726\times10^{-27} \text{ kg} \tag{24}$$