1 Formulas for 1^{st} Midterm (FINAL VERSION)

One dimensional motion in x:

$$x = x_0 + v_0 t + \frac{1}{2}at^2 \tag{1}$$
$$v = v_0 + at \tag{2}$$
$$v^2 = v_0^2 + 2a(x - x_0) \tag{3}$$

Projectile Motion:

x	y
$x = x_0 + v_{0x}t$	$y = y_0 + v_{0y}t - \frac{1}{2}gt^2$
$v_x = v_{0x}$	$v_y = v_{0y} - gt$
$v_x^2 = v_{0x}^2$	$v_y^2 = v_{0y}^2 - 2g(y - y_0)$

Forces:

$$\Sigma\vec{F} = m\vec{a} \tag{4}$$
$$F_s \leq \mu_s N \tag{5}$$
$$F_k = \mu_k N \tag{6}$$
$$F_{spring} = -kx \tag{7}$$
$$\tag{8}$$

Energy:

Form	Equation
Kinetic	$\frac{1}{2}mv^2$
Gravity	mgy
Spring	$\frac{1}{2}kx^2$

2 Formulas for 2^{nd} Midterm

Newtonian Gravity:

$$F_g = G\frac{Mm}{r^2} \tag{9}$$
$$PE_g = -G\frac{Mm}{r} \tag{10}$$

Momentum:

$$\vec{p} = m\vec{v} \tag{11}$$
$$\vec{F}_{external}\Delta t = \Delta\vec{p} \tag{12}$$

Elastic Collisions:

$$v_1 - v_2 = -(v_1' - v_2') \tag{13}$$

Circular Motion:

$$a_c = \frac{v^2}{r} \tag{14}$$

Rotation-Translation Correspondence:

Translation	Rotation	Conversion
x or s	θ	s = rθ
v	ω	v = rω
a	α	a = rα
m	I	I = $\sum mr^2$
F	τ	$\tau = r_\perp F = rF_\perp$
p	L	L = Iω

One dimensional motion in θ:

$$\theta = \theta_0 + \omega_0 t + \frac{1}{2}\alpha t^2 \tag{15}$$

$$\omega = \omega_0 + \alpha t \tag{16}$$

$$\omega^2 = \omega_0^2 + 2\alpha(\theta - \theta_0) \tag{17}$$

Cause-effect for rotations:

$$\sum \tau = I\alpha \tag{18}$$

$$KE_{rotation} = \frac{1}{2} I\omega^2 \tag{19}$$

$$W_{rotation} = \tau \Delta\theta \tag{20}$$

$$\tau = \frac{\Delta L}{\Delta t} \tag{21}$$

Static Equilibrium:

$$\sum F_x = 0 \tag{22}$$

$$\sum F_y = 0 \tag{23}$$

$$\sum \tau = 0 \tag{24}$$

Fluids:

$$P_1 + \frac{1}{2}\rho v_1^2 + \rho g y_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho g y_2 \tag{25}$$

$$A_1 v_1 = A_2 v_2 \tag{26}$$

$$F_{bouyancy} = weight\ of\ fluid\ displaced = \rho V_d g \tag{27}$$