

Matter & Motion Fall Quarter Physics Master Equation List - Wolfson

Chapter 2: 1D Kinematics	Valid when... and other notes
$v = v_0 + at$	
$x = x_0 + \frac{1}{2}(v_0 + v)t$	
$x = x_0 + v_0t + \frac{1}{2}at^2$	
$v^2 = v_0^2 + 2a(x - x_0)$	
$\bar{v} = \frac{\Delta x}{\Delta t}$	
$\bar{a} = \frac{\Delta v}{\Delta t}$	
$v = \frac{dx}{dt}$	
$a = \frac{dv}{dt}$	

Chapter 3: 2D, 3D Kinematics	Valid when... and other notes
$A = \sqrt{A_x^2 + A_y^2}$	
$\theta = \tan^{-1} \frac{A_x}{A_y}$	
$A_x = A \cos \theta$	
$A_y = A \sin \theta$	
$\vec{A} = A_x \hat{i} + A_y \hat{j}$	
$\vec{v} = \frac{d\vec{r}}{dt}$	
$\vec{a} = \frac{d\vec{v}}{dt}$	
$\vec{v} = \vec{v}_0 + \vec{a}t$	
$\vec{r} = \vec{r}_0 + \vec{v}_0t + \frac{1}{2}\vec{a}t^2$	
$a = \frac{v^2}{r}$	

Chapter 4: Force & Motion	Valid when... and other notes
$\vec{F}_{\text{net}} = \frac{d\vec{p}}{dt}$	
$\vec{p} = m\vec{v}$	
$\vec{F}_{\text{net}} = m\vec{a}$	
$\vec{w} = m\vec{g}$	
$F_s = -kx$	

Chapter 5: Using Newton's Laws	Valid when... and other notes
$f_s \leq \mu_s n$	
$f_k = \mu_k n$	
Chapter 6: Energy, Work & Power	Valid when... and other notes
$W = F_x \Delta x$	
$W = \vec{F} \cdot \Delta \vec{r} = F \Delta r \cos \theta$	
$\vec{A} \cdot \vec{B} = AB \cos \theta$	
$W = \int_{x_1}^{x_2} F(x) dx$	
$W = \int \vec{F} \cdot d\vec{r}$	
$K = \frac{1}{2}mv^2$	
$\Delta K = W_{\text{net}}$	
$P = \frac{dW}{dt} = \vec{F} \cdot \vec{v}$	
$W = mgh$	
$W = \frac{1}{2}kx^2$	

Chapter 7: Conservation of Energy	Valid when... and other notes
$\Delta U_{AB} = - \int_A^B \vec{F} \cdot d\vec{r}$	
$\Delta U = - \int_{x_1}^{x_2} F(x) dx$	
$\Delta U = -F(x_2 - x_1)$	
$K + U = K_0 + U_0$	
$U = \frac{1}{2} kx^2$	
$\Delta U = mgh$	

Chapter 9: Systems of Particles	Valid when... and other notes
$\vec{r}_{\text{cm}} = \frac{\sum m_i \vec{r}_i}{M}$	
$\vec{r}_{\text{cm}} = \frac{\int \vec{r} dm}{M}$	
$\vec{F}_{\text{net ext}} = M\vec{a}_{\text{cm}} = \frac{d\vec{P}}{dt}$	
$m_1 \vec{v}_1 + m_2 \vec{v}_2 = (m_1 + m_2) \vec{v}_f$	
$m_1 \vec{v}_{1i} + m_2 \vec{v}_{2i} = m_1 \vec{v}_{1f} + m_2 \vec{v}_{2f}$	
$\frac{1}{2} m_1 v_{1i}^2 + \frac{1}{2} m_2 v_{2i}^2 = \frac{1}{2} m_1 v_{1f}^2 + \frac{1}{2} m_2 v_{2f}^2$	

Chapter 10: Rotational Motion	Valid when... and other notes
$\bar{\omega} = \frac{d\theta}{dt}$	
$\tau = rF \sin \theta$	
$I = \sum m_i r_i^2 \rightarrow \int r^2 dm$	
$v = \omega r$	
$a_t = \alpha r$	
$K_{\text{rot}} = \frac{1}{2} I \omega^2$	
$\tau = I \alpha$	
$\omega = \omega_0 + \alpha t$	
$\theta = \theta_0 + \frac{1}{2}(\omega_0 + \omega)t$	
$\theta = \theta_0 + \omega_0 t + \frac{1}{2} \alpha t^2$	
$\omega^2 = \omega_0^2 + 2\alpha(\theta - \theta_0)$	
Chapter 11: Rotational Vectors & Angular Momentum	Valid when... and other notes
$\vec{C} = \vec{A} \times \vec{B} \rightarrow C = AB \sin \theta$	
$\vec{\tau} = \vec{r} \times \vec{F}$	
$\vec{L} = \vec{r} \times \vec{p}$	
$\frac{d\vec{L}}{dt} = \vec{\tau}_{\text{net}}$	
$\vec{L} = I \vec{\omega}$	