Putting it all together

The chart on below shows all of the linear motion and dynamic variables along with their rotational counterparts. Keep this chart out and handy for ready reference to help you from getting "lost" in all the symbols. You should make sure that you recognize the meaning behind the symbols when you see on of these relationships.

Summary Listing Fundamental Concepts Used in Mechanics Emphasizing Translational and Rotational Counterparts

Category	Concept	Translation	Rotation	Relation
Kinematic Variables	Position Velocity Acceleration	x $v=\dfrac{dx}{dt}$ $a=\dfrac{dv}{dt}$	θ $\omega=\frac{d\theta}{dt}$ $\alpha=\frac{d\omega}{dt}$	$\theta=\frac{s}{r}$ $\omega=\frac{v}{r}$ $\alpha=\frac{a}{r}$
Fundamental Dynamic Variables	Force/Torque Mass/Inertia Momentum Impulse Momentum-Impulse	F m $p=mv$ $J=\int Fdt$ $J_{ext}=\Delta p$	τ I $L=I\omega$ ang $J=\int \tau dt$ ang $J_{ext}=\Delta L$	$\tau=rF_\perp$ $I=\sum mr^2$ $L=rp_\perp$
Newton's Laws	First Law Second Law Third Law	if $F_{net}=0$, then $\Delta p=0$ $F_{net}=ma$ or $F_{net}=\frac{dp}{dt}$ $F_{1\,on\,2}=-F_{2\,on\,1}$ $J_{1\,on\,2}=-J_{2\,on\,1}$	if $\tau_{net}=0$, then $\Delta L=0$ $\tau_{net}=I\alpha$ or $\tau_{net}=\frac{dL}{dt}$ $\tau_{1\,on\,2}=-\tau_{2\,on\,1}$ ang $\boldsymbol{J_{1\,on\,2}}=-$ang $\boldsymbol{J_{2\,on\,1}}$	
Energy	Kinetic Energy Work	$KE=\frac{1}{2}mv^2$ $W=\int_{x_1}^{x_2}\vec{F}\cdot d\vec{s}$	$KE=\frac{1}{2}I\omega^2$ $W=\int_{\theta_1}^{\theta_2}\vec{\tau}\cdot d\vec{\theta}$	

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