

# Work and Power

①

Translation

$$W = \int F(x) dx$$

$$W = F_x \Delta x$$

$$P = \frac{dW}{dt}$$

$$P = F_x v_x$$

Rotation

$$W = \int \tau(\theta) d\theta$$

$$W = \tau_x \Delta \theta_x$$

$$P = \frac{dW}{dt}$$

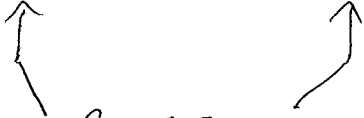
$$P = \tau_x \omega_x$$

2

# Angular Momentum (L)

General Equation for particle

$$\vec{L} = \vec{r} \times \vec{p} = \vec{r} \times m\vec{v}$$


  
 Cross Product

$$L = mvr \sin\phi$$

$\phi$  = angle between line of action  
of  $\vec{r}$  and  $\vec{v}$

$\frac{d\vec{L}}{dt} = \vec{r} \times \vec{F} = \vec{\tau}$	<u>linear form</u> $\frac{d\vec{p}}{dt} = \vec{F}$
-------------------------------------------------------------	-------------------------------------------------------

Change in angular momentum is produced by a torque just as

Change in linear momentum is produced by a force.

3

General Equation for rotating non-particle bodies

$$\vec{L} = I\vec{\omega}$$

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

↑

Net torque produces a change in momentum.

Angular Momentum is a conserved quantity just as Linear Momentum.

\* Systems without a net torque (or  $\sum \tau = 0$ ) will conserve angular momentum

4

This result can be used  
in collisions that involve  
rotating objects.