EQUATIONS

$$W = \Delta E = \int \bar{F} \cdot d\bar{r}$$

- W: Work
- ΔE: change in Energy
- $\bar{F}$: Force
- $\cdot$: dot product
- $d\bar{r}$: displacement

$$K = \frac{1}{2} m v^2$$

- K: Kinetic Energy
- m: mass
- v^2: velocity

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

- P: Power
- dE: change in Energy
- dt: change in time

$$P = \bar{F} \cdot \bar{v}$$

- P: Power
- $\bar{F}$: Force
- $\cdot$: dot product
- $\bar{v}$: velocity

$$\Delta U_g = mg\Delta h$$

- ΔU_g: change in gravitational Potential Energy
- m: mass
- g: acceleration due to gravity
- Δh: change in height

$$a_c = \frac{v^2}{r} = \omega^2 r$$

- a_c: centripetal acceleration
- v: tangential velocity
- r: radius
- ω: angular speed

$$\bar{\tau} = \bar{r} \times \bar{F} = rF\sin\theta$$

- $\bar{\tau}$: torque
- $\bar{r}$: radius
- $\times$: cross product
- $\bar{F}$: Force

$$\bar{\alpha} = \frac{\sum \bar{\tau}}{I} = \frac{\bar{\tau}_{net}}{I}$$

- $\bar{\alpha}$: angular acceleration
- $\sum \bar{\tau}$: net torque
- I: moment of inertia
- $\bar{\tau}_{net}$: net torque
- I: moment of inertia

$$I = \int r^2 \, dm = \sum m r^2$$

- I: moment of inertia
- r: radius to dm
- dm: small piece of mass
- m: mass
- r: radius

$$X_{cm} = \frac{\sum m_i x_i}{\sum m_i}$$

- X_{cm}: center of mass
- $\sum m_i x_i$: sum of (masses)(positions)
- $\sum m_i$: sum of masses