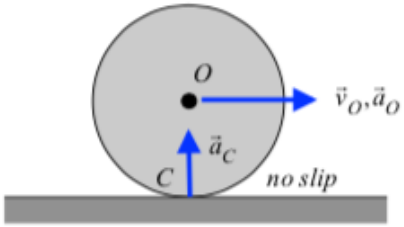
Summary: Newton/Euler Equations 2

FUNDAMENTAL equations:

(1) $\sum \vec{F} = m\vec{a}_G$

(2) $\sum \vec{M}_A = I_A \vec{\alpha}$; A = c.m. <u>*OR*</u> fixed point <u>*OR*</u> $\vec{r}_{G/A} \parallel \vec{a}_A$



MASS MOMENT OF INERTIA: $I_A = \int r^2 \, dm$, with *r* measured from point A

- circular disk of radius R, mass m and c.m. at G: $I_G = mR^2/2$
- thin bar of length L, mass m and c.m. at G: $I_G = mL^2/12$

PARALLEL AXES THEOREM: $I_A = I_G + md^2$

- You MUST have I_G on the right-hand side of the P.A.T. equation.
- The mass moment of inertia about the c.m. is the smallest for all points on the body.
- When do you need to use this? *Useful when a non-centroidal point is used in Euler's equation.*

RADIUS OF GYRATION: $k_A \triangleq \sqrt{I_A / m}$. *Dependent only on the "shape", NOT on the mass.*