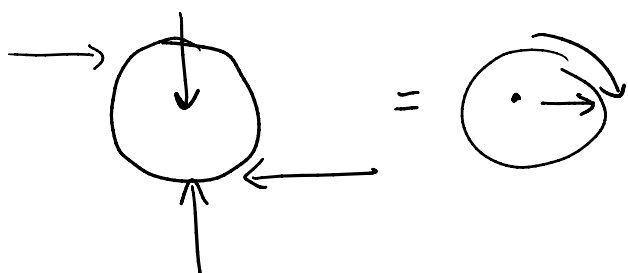# Rigid Body Kinetics—General Planar Motion

$$\Sigma F_x = m(a_G)_x$$

$$\Sigma F_y = m(a_G)_y$$

$$\Sigma M_G = I_G \alpha \quad \text{or} \quad \Sigma M_o = I_o \alpha$$

Rolling Motion

If disk rolls without sliding mass center of acceleration a_G and angular acceleration are not independent $a_G = r\alpha$

$$=$$

$$F_F \leq \mu_s N$$

Rotates and slides

$\bar{a}$ and α are independent $F_F = \mu_K N$

1st assume it rolls without sliding

$a = r\alpha$ check $F_F \leq \mu_s N$ (done)

2nd rework $F_F = \mu_K N$