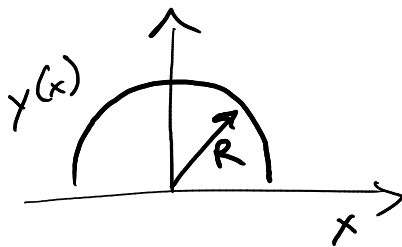


$$\theta \ll 1$$

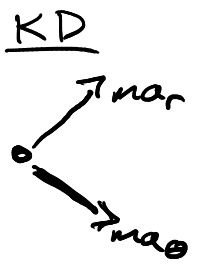
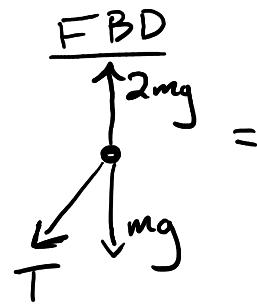
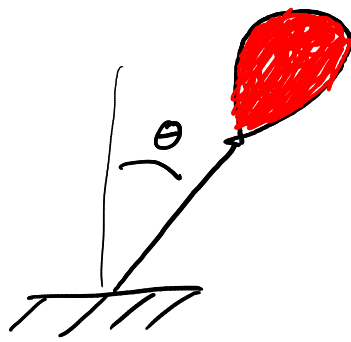
$$\cos \theta = 1$$

$$mg \cos \theta - N = \frac{mv^2}{R}$$



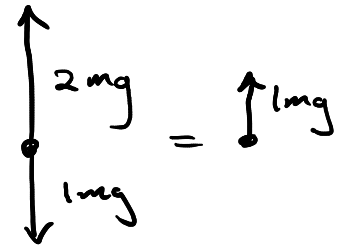
$$y = \sqrt{R^2 - x^2}$$

$$\text{slope} = \frac{dy}{dx} = \frac{-x}{\sqrt{R^2 - x^2}}$$



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$$\ddot{\Theta} = f(\Theta)$$



$$\hat{e}_r \Rightarrow -T + mg \cos \theta = m(-r\dot{\Theta}^2)$$

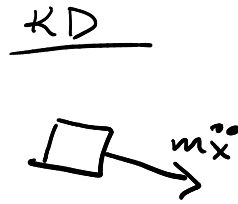
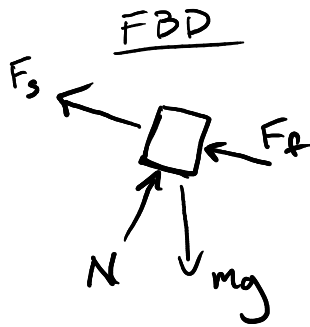
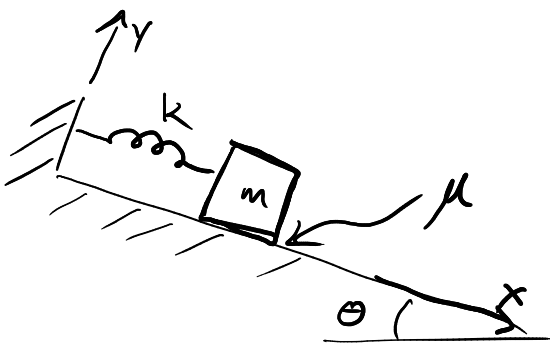
$$\hat{e}_\theta \Rightarrow -mg \sin \theta = m(r\ddot{\Theta})$$

if $\theta = \frac{\pi}{4} = 45^\circ$

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$$\ddot{\Theta} = -\frac{g}{r} \sin \theta$$

$$\ddot{\Theta} = -\frac{g}{r} \sin \frac{\pi}{4} = -\frac{g}{r} \cdot \frac{\sqrt{2}}{2}$$



$$F_f = \mu N \cdot \frac{\dot{x}}{|\dot{x}|}$$

$$\ddot{x} = -\mu g \cos \theta - \frac{k}{m}x + g \sin \theta$$

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