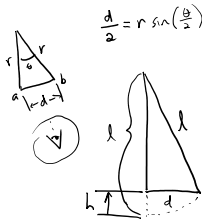
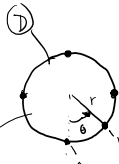
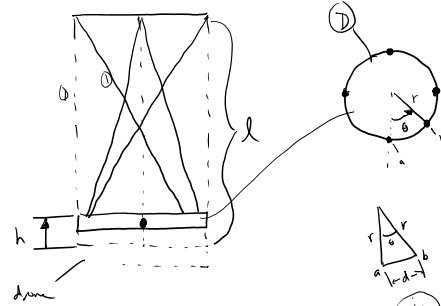
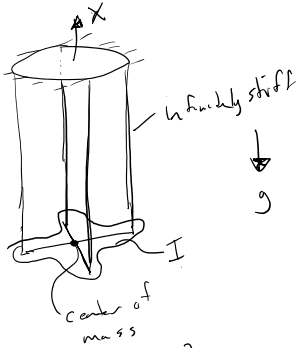


Trifilar Pendulum



$$\frac{d}{2} = r \sin\left(\frac{\theta}{2}\right)$$

$T = \frac{1}{2} m \dot{h}^2 + \frac{1}{2} I \dot{\theta}^2$ θ : generalized coordinates
 $U = mgh$ write h in terms of θ

$$l^2 = d^2 + (l-h)^2$$

$$\sqrt{l^2 - d^2} = l - h$$

$$h = l - \sqrt{l^2 - d^2}$$

$$h = l - \sqrt{l^2 - (2r \sin \frac{\theta}{2})^2}$$

$$\left(I + \frac{I^*}{\equiv} \right) \ddot{\theta} + f(\dot{\theta}, \theta, \text{constants}) = 0$$

↑ 1st order form

$\omega = \dot{\theta}$ ← first of two 1st order ODEs
 ↑ generalized speed

two first order nonlinear ODEs

$$I^* \dot{\omega} + f(\omega, \theta, \text{constants}) = 0$$

$$\dot{\omega} = \frac{-f(\omega, \theta, \text{constants})}{I}$$

$$\dot{\theta} = \omega$$

r h s of $\dot{\theta}$ ODEs