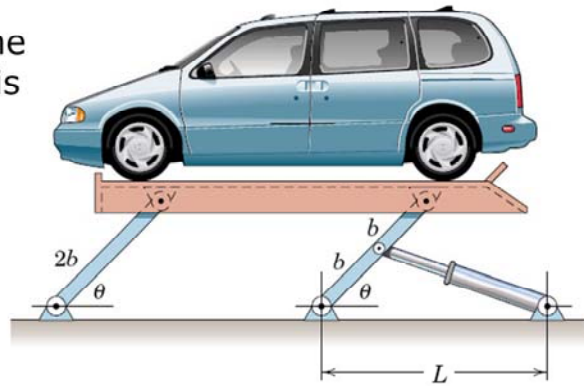


Absolute Motion: Yet Another Exercise

Derive an expression for the upward **velocity** of the car hoist in terms of θ .

The piston rod of the hydraulic cylinder is extending at the rate \dot{s} .



ME 231: Dynamics

5/44

$$y = 2b \sin \theta$$

$$v = \dot{y} = 2b \dot{\theta} \cos \theta$$

$$s^2 = b^2 + L^2 - 2bL \cos \theta$$

$$2s\dot{s} = 0 + 0 + 2bL\dot{\theta} \sin \theta$$

$$\dot{\theta} = \frac{s\dot{s}}{bL \sin \theta}$$

$$\text{so } v = 2b \frac{s\dot{s}}{bL \sin \theta} \cos \theta = 2 \frac{\sqrt{b^2 + L^2 - 2bL \cos \theta}}{L \tan \theta} \dot{s}$$

