

$$1. \quad \mu = \frac{MgR - \frac{1}{2}kd^2}{Mg(L+d)}$$

$$2. \quad H = 2.5R$$

$$3. \quad \begin{aligned} W_{ABC} &= -2\mu MgL \\ W_{AC} &= -\sqrt{2}\mu MgL \\ W_{ADA} &= -2\mu MgL \\ &\text{not conservative} \end{aligned}$$

$$4. \quad v_f = \sqrt{\frac{2}{m+M} \left(MgH - mgH \sin \theta - \frac{1}{2}kH^2 - \mu mg \cos \theta H \right)}$$