

Written homework solutions.

WEEK 9

Need to find the velocity  $v_B$  at point B. Start by defining  $y=0$  at bottom of circle.

Total mechanical energy is conserved. Since ball stops at point D, we know energy is all potential there:

$$E_{\text{mech}} = mg(2L)$$

This is all kinetic at bottom:

$$KE_{\text{point B}} = E_{\text{mech}} = 2mgL = \frac{1}{2}mv_B^2$$

$$\Rightarrow \frac{1}{2}v_B^2 = 2gL$$

$$v_B^2 = 4gL$$

$$F_{\text{net}} = F_c = \frac{mv_B^2}{L} = \frac{m(4gL)}{L} = T - mg$$

$$\text{so } T = mg + 4mg = \boxed{5mg}$$