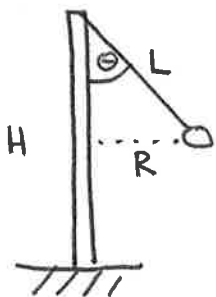


Ex 24.3

Tetherball problem

(solution by Ellen Hwang!)



- The transverse braking moment, or torque, applied to the vertical post is $\tau = HT \sin \theta$ where T is the tension in the rope.

- To keep the torque constant, we need (as the ball speeds up)

$$H' T' \sin \theta' = HT \sin \theta$$

- The tension in the rope is $T = \frac{mv^2}{R}$. So

$$H' \frac{mv'^2}{L \sin \theta'} \sin \theta' = H \frac{mv^2}{L \sin \theta} \sin \theta$$

$$\frac{H' v'^2}{L} = \frac{H v^2}{L}$$

$$\frac{H'}{H} = \frac{v^2}{v'^2}$$

- So if we double the velocity of the ball, the height must be reduced by a factor of 4.