

Chapter 12 Homework Problems

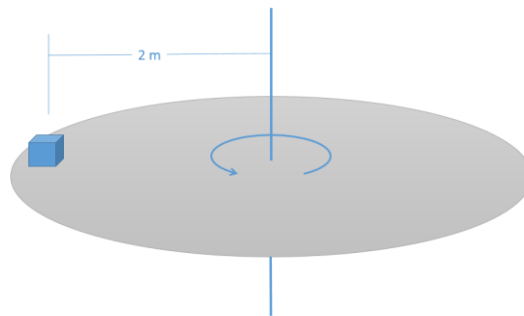
Problem 12.1

A three-kilogram cannonball is shot out of a cannon with an initial velocity of 300 m/s at a 25° angle. A headwind exerts a constant 5 N horizontal force. How far will the cannonball travel before horizontally hitting the ground?

(Solution: $d = 6470$ m)

Problem 12.2

A 1 kg block sits on a rotating table as shown below. If the static coefficient of friction is assumed to be .4, what is the maximum angular velocity ($\dot{\theta}$) that can be achieved before the block begins to slip?

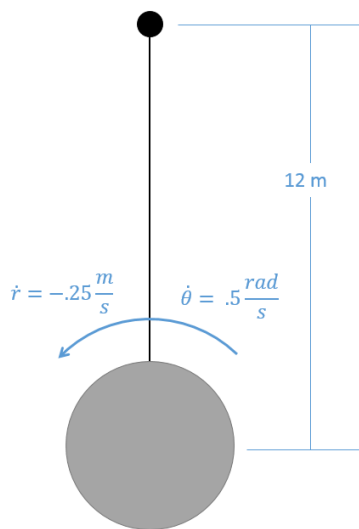


(Solution: $\dot{\theta} = 1.4 \frac{rad}{s}$)

Problem 12.3

A 5 kg instrument is held via a cable to a space station. The instrument and space station are both rotating at a rate of .5 rad/s when the space station begins retracting the cable at a constant rate of .25 m/s.

- What is the tension in the cable at this instant?
- What will the angular acceleration of the cable be ($\ddot{\theta}$)?
(Hint: there are no forces in the theta direction)



(Solution: $T = 15 \text{ N}$, $\ddot{\theta} = 0.0208 \frac{rad}{s^2}$)