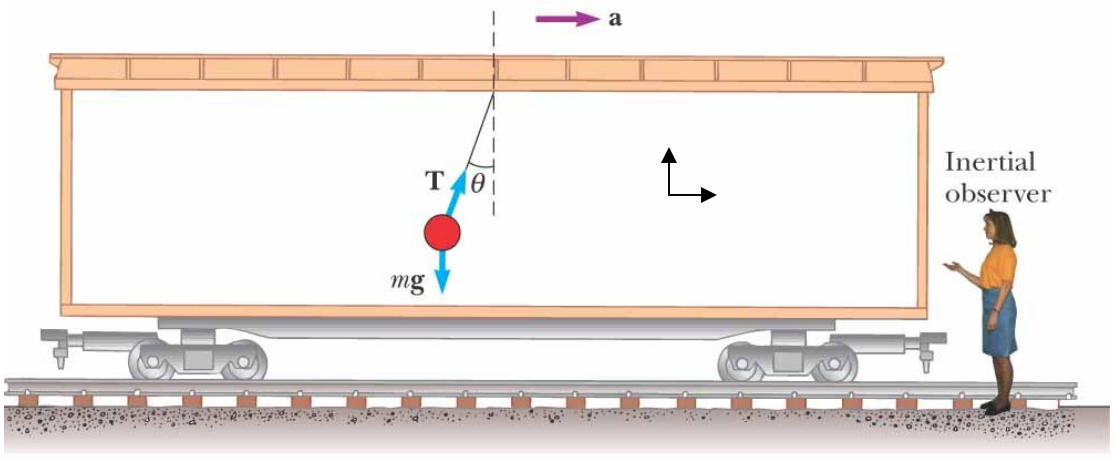
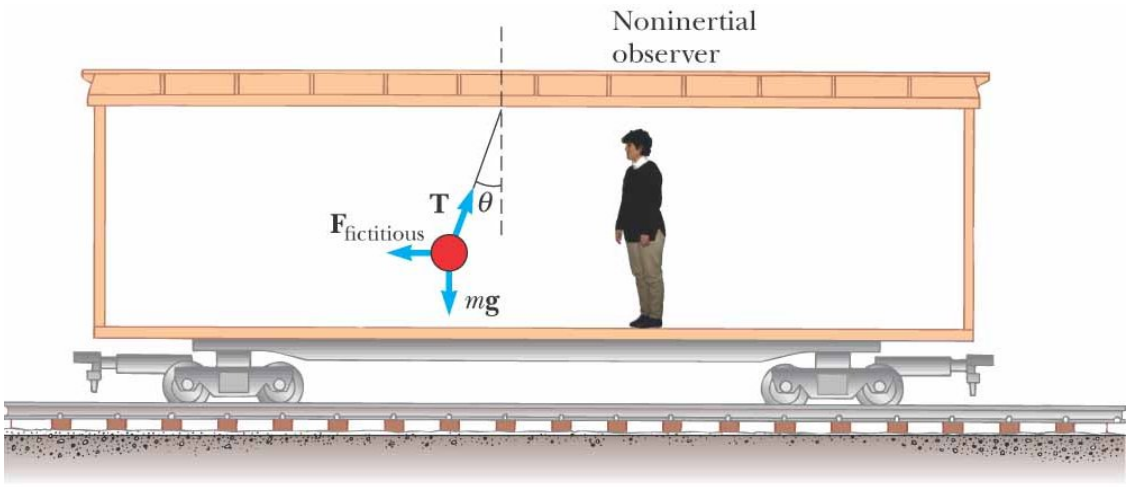
Linear Accelerating Reference Frame

(Inertial & Non-inertial Observers)



An inertial observer <u>correctly</u> reports that the inertia of the ball causes it to deflect ***to the left*** as the boxcar accelerates ***to the right***.

$$\begin{cases} \sum F_x = T\sin\theta = ma \\ \sum F_y = T\cos\theta - mg = 0 \end{cases}$$



A non-inertial observer <u>incorrectly</u> reports that the net force on the ball is zero and that it is deflected ***to the left*** because it is being acted upon by a force $\mathbf{F}_{\text{fictitious}}$ ***to the right*** which balances the horizontal component of **T**.

$$\begin{cases} \sum F'_x = T\sin\theta - F_{fictitious} = 0 \\ \sum F'_y = T\cos\theta - mg = 0 \end{cases}$$