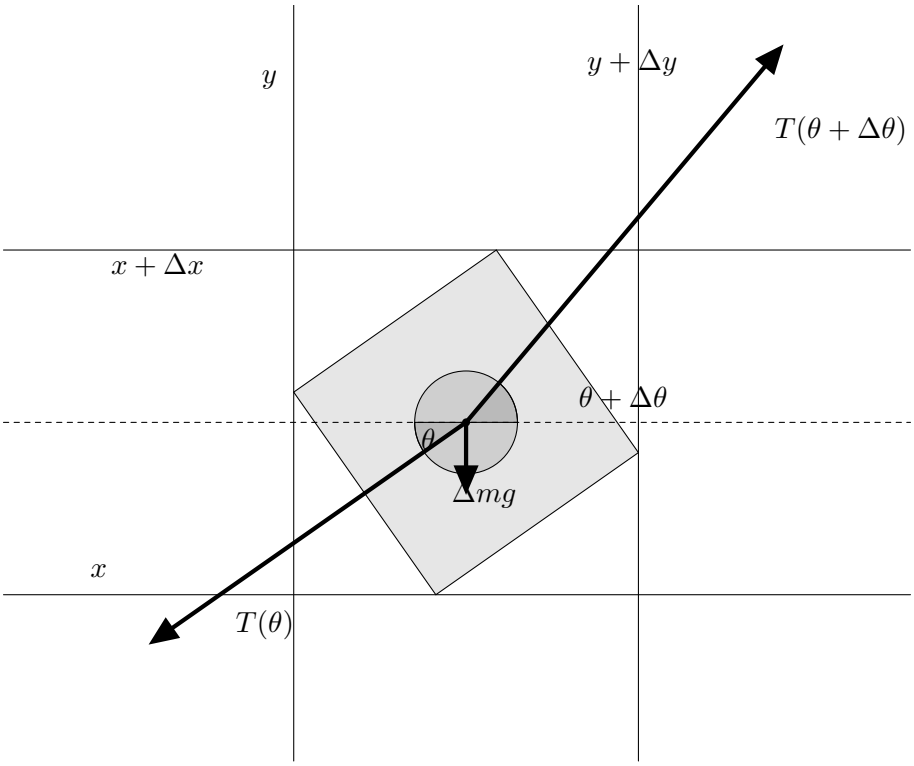
Catenary Problem



$$
\begin{aligned}
\hat{T}: \qquad T(\theta)\cos\theta &= T(\theta+\Delta\theta)\cos(\theta+\Delta\theta) \\
T(\theta) &= \frac{T(\theta+\Delta\theta)\cos(\theta+\Delta\theta)}{\cos\theta} \\
T(\theta) - T(\theta+\Delta\theta) &= \frac{T(\theta+\Delta\theta)\cos(\theta+\Delta\theta)}{\cos\theta} - T(\theta+\Delta\theta) \\
&= \frac{T(\theta+\Delta\theta)}{\cos\theta}(\cos(\theta+\Delta\theta) - \cos\theta)
\end{aligned}
$$

$$
\begin{aligned}
\lim_{\Delta\theta\to 0} \frac{T(\theta) - T(\theta+\Delta\theta)}{\Delta\theta} &= \lim_{\Delta\theta\to 0} \frac{T(\theta+\Delta\theta)}{\cos\theta} \cdot \frac{\cos(\theta+\Delta\theta) - \cos\theta}{\Delta\theta} \\
-\frac{d}{d\theta}T(\theta) &= \frac{T(\theta)}{\cos\theta}\frac{d}{d\theta}\cos\theta \\
\frac{dT}{d\theta} &= T(\theta)\tan\theta \\
\ln\left(T(\theta)\right) &= C - \ln\left(\cos\theta\right) \\
T(\theta) &= c\sec\theta
\end{aligned}
$$